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ABSTRACT

This reference guide is designed to organize and suggest acceptable practices and procedures for dealing with safety in elementary science instruction. It is intended as a reference for teachers, administrators, and other school staff in planning for science activities and in making daily safety decisions. Topics covered in the guide include: (1) responsibility; (2) animals; (3) chemicals; (4) electricity; (5) field trips; (6) first aid; (7) high risk labs; (8) lab equipment; (9) open flames; (10) plants; (11) model rockets, etc.; and (12) safety glasses. Several appendices deal with specialized considerations. (Author/RE)

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OAKLAND COUNTY

SCIENCE SAFETY SERIES

REFERENCE GUIDE

FOR

ELEMENTARY SCIENCE

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Safety Subcommittee

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PREFACE

Teachers of science are in a unique position to assist students in understanding and appreciating the importance of safety education. Properly conducted classroom activities, experiments and demonstrations, can show their students how to anticipate and cope with the problems of safety in science. Good instruction can establish a school environment in which safety awareness and practice grows and becomes an integral part of the lives of our students.

With this in mind, the Oakland County Science Safety Series Reference Guides have been developed for the Biological, Chemical, Physical and Elementary areas of science. The Science Safety Series can provide teachers and administrators with specific information in answering questions on safety practices, problems and responsibilities that are most likely to occur in the areas of science instruction, and they also provide assistance in developing a safe laboratory environment that does not, at the same time, unduly restrict scientific inquiry, activity and attitude.

This "Reference Guide" is designed to organize and suggest acceptable practices and procedures for dealing with safety in the area of science instruction. It is intended as a reference for teachers, administrators and other school staff both in planning for science activities and making "on the spot" safety decisions.

It should be emphasized that this guide is only a starting point for good practices. In no way does it intend to establish universal laws, regulations or rules. The contents presented have no legal implications, and should not be read as legal requirements. It is strongly recommended that the reader determine the legal liability of teacher and/or administrator, as well as, pertinent local, state and federal laws and regulations. Further information on teacher liability can be found in Appendix A.

The working conditions of teachers are protected by the Michigan Occupational Safety and Health regulations (MIOSHA, Act 154 of 1974). Although MIOSHA regulations do not apply specifically to students, they do affect student laboratory safety conditions in an indirect manner. Further information on MIOSHA regulations can be found in Appendix B.

In addition, some school districts have operational statements concerning safety, and it is important that the administrator-teacher be aware of such policies and operating procedures as they relate to science.

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I. RESPONSIBILITY FOR SAFETY

I. RESPONSIBILITY FOR SAFETY

Introduction

A district-wide science safety program must start at the highest level of administration and continue down through every level of the school community.

The members of the professional staff of the district must recognize and accept their moral and legal safety responsibilities and insist upon safe procedures in all science teaching areas.

Modern science instruction requires the active participation by the student. This raises safety questions not common to the more conventional course of study. Laboratory situations involving student participation are found at all grade levels.

One of the objectives of teaching science is to prepare students to function in a technological society. In such a society, a great many biological, chemical, and physical hazards exist. Therefore, it is natural that any instructional program will expose students to some potential dangers. It is the responsibility of the school to recognize these dangers, bring them to the attention of the students, and still allow the students to experience and discover the wonders of science.

Everyone involved in the administration, or teaching of a science program, should be aware of the federal, state, county, and local laws that apply to science teaching situations. (See Appendix for listing of federal and state laws).

Safety involves positive goals. The development and operation of a working safety program requires the active participation of all members of the educational community.

A. ADMINISTRATION

In order to achieve district or school safety goals the administration should:

1. Actively support and display a good attitude toward school safety. Interest must be vocal, visible, and continuous.

2. Establish a written district-wide safety policy and program.

3. Stress and enforce the district-wide safety policy. Hold in-service education sessions with the teachers of science concerning the district-wide safety policy and program. This should include first-aid, fire prevention, general student protection (including personal protective equipment), and new safety procedures and considerations. This may mean the appointment of a safety committee and/or safety officers.

4. Be aware of rules governing teacher liability for classroom accidents, and include this topic in in-service and orientation sessions.

5. Assist and encourage the teacher to correct and avoid situations that could result in liability to the teacher and the school.

6. Provide for proper safety equipment in all science laboratories as directed by MIOSHA regulations.

7. Delegate responsibilities to the staff and ultimately to the students. Hold staff accountable for safety practices in their respective areas.

8. Analyze accident records in order to determine the most frequent causes of accidents and the more severe types of accidents. Take corrective measures to change accident-causing conditions.

9. Make safety literature, posters and safety promotional material available to all persons associated with the safety program.

10. Set up a program for the safety orientation for new personnel.

11. Instruct the maintenance department in the proper handling and disposal of science materials.

12. Overcrowding of classes should not be allowed in science laboratories. Consideration of whether overcrowding exists should take into account the physical size of a room, the arrangement of the furniture and the facilities in the room, the kind of activities that are being carried out in the room, and the number of students in the class.

13. Designate a safety officer for the science department.

B. TEACHERS

The real key to safety in the science class is the teacher. The teacher is responsible for being the leader in demonstrating and correlating safe practices in the science areas. The teacher should:

1. Be aware of the district-wide safety policy. Become familiar with implications of MIOSHA regulations as they apply to teaching duties.

2. Adhere to the district-wide safety policy as it applies to the teacher and the students under his supervision.

3. Enforce district-wide safety procedures. This can be carried out by requesting a student practicing an unsafe act or creating an unsafe condition to promptly correct the hazard. Failure to comply could result in suspension or cancellation of lab privileges. Report MIOSHA violations to the proper administrator.

4. Understand the teacher's relationship to the system-wide safety committee or safety supervisor.

5. Maintain safe working conditions, promote safe working methods, enforce the use of personal protective equipment and regulations, and establish the proper attitude toward safety in the classroom. The teacher should have the authority to close down a laboratory for a day, if he feels the environment is hazardous to the students' well-being.

6. Know his areas of responsibility and authority in the area of safety. Be aware of the teacher's total responsiblity in terms of operations, machines, personnel, maintenance, repairs, working conditions, and accident reporting.

7. Notify the administration of any potential hazards. Do not allow students to work under unsafe conditions.

8. Determine the qualifications for student assistants. Supervise student assistants.

9. Be aware of the safety considerations for each laboratory activity and instruct the students in this area prior to the start of each exercise.

10. Do not allow the students to experiment on their own without proper supervision.

11. Make safety suggestions to administrative safety supervisor.

12. Review all laboratory manuals to determine the type and extent of hazards introduced by the various experiments and procedures. Analyze all laboratory experiences for possible safety hazards prior to introducing the material to the students.

13. Read and post safety literature, posters and safety promotional material.

14. Assist new teachers in learning and using the school safety code.

15. Know the location of and be able to properly use all science safety devices.

16. Do not work alone in a science laboratory and do not allow students to work alone.

17. Pretest all devices and/or equipment brought into class by a student prior to allowing students to use such devices.

18. Consult people with special knowledge or experience if unsure about using a new technique, chemical, or equipment.

C. STUDENTS

Accidents can be prevented only by each individual working in the laboratory in a safe manner. The students should:

1. Follow the general safety policies of the school district.

2. Maintain safe working conditions as they apply to the individual and the group. Use personal protective equipment and follow personal protective regulations.

3. Be aware of the safety considerations for each laboratory activity prior to the start of each exercise. Follow the safety instructions while performing the laboratory exercise.

4. Survey the student work areas in order to anticipate potential hazards and then take preventive measures and/or report such hazards.

5. Make safety suggestions to the teacher or safety supervisor.

6. Read, learn and follow the safety materials that are posted in the science room.

7. Not work alone in a science laboratory, or experiment on their own without proper supervision, nor use unfamiliar equipment.

8. Report all injuries to the teacher immediately regardless of how minor.

9. Learn to use science equipment correctly and safely. Work in such a manner that other students are not placed in a potentially dangerous situation.

10. Completely clean up all work areas at the completion of an exercise or laboratory period.

D. MAINTENANCE

The maintenance department of a district or school also has a role in the safety program. The maintenance department should:

1. Be aware of the district-wide safety policy.

2. Establish the maintenance of science areas as a high-priority item. Some responsible person should periodically inspect the science teaching areas for such maintenance items as gas leaks, storage problems, electrical outlets, safety signs, and any other potential hazards.

3. Learn the proper handling and disposal of science materials.

4. Keep all science areas equipped with the necessary science safety materials.

5. Be certain that the science equipment is secure during non-class hours after school, and at night. This is especially important if the school building is used after the end of the normal school day.

II. ANIMALS IN THE CLASSROOM

REFERENCE PAGE FOR ANIMALS IN THE CLASSROOM

1. No experiment should be performed which will cause pain, suffering, or discomfort to an animal. For more information see Precautions #1 page 8, and Appendix D, State and federal Laws.

2. Animals must be housed, fed and cared for to maintain normal growth. For more information see Precautions #1, d - g , page 8 , and Appendix D, State and Federal Laws.

3, Wild animals should never be brought into the classroom.

4. Handle animals only when necessary. For more information see Precautions #1 j - l , page 8 .

5. Animal bites and scratches should be washed and reported immediately. For more information see Precautions #1 and #5, pages 8-9, and First Aid, Chapter VI.

6. Animal wastes and bedding should be disposed of in a safe and sanitary manner. For more information see Precautions #1, n; #2 , page 9 .

7. An unusual odor from the cage could indicate illness. For more information see Precautions #3 , page 9 .

8. Wash hands after handling snakes, turtles, fish, frogs, toads, etc. For more information see Precautions #5, a , page 9 .

9. After observation, all cold-blooded animals should be returned to their natural environment.

10. Poisonous snakes should never enter the classroom. For more information see Precautions #5, c , page 10.

II. ANIMALS IN THE CLASSROOM

Introduction

Children naturally love animals. They can be a rewarding learning experience in the elementary classroom. Teachers should utilize the rewards animals have to offer. Care must be taken, however, to insure that any animal is treated in a humane manner. Federal, state, and local laws must be observed when housing animals in the classroom.

A. Statement of Hazards

Any animal kept in the classroom could cause a potential problem. Disease, parasites and biting should be guarded against. Proper housing and diet is mandatory for the animal.

1. Warm-Blooded

a. No experiment should be performed which will cause an animal pain, suffering, or discomfort.
b. No surgery should be performed on any living vertebrate.
c. Animal observations must be supervised by the teacher.
d. Food must be provided to maintain normal growth. Deficient diets should not be used except under proper supervision and never to the point of permanent harm to the animals. Clean drinking water must be available at all times.
e. Eggs receiving manipulation should not be allowed to hatch.
f. The animals should be housed in appropriate spacious, comfortable, sanitary quarters. Housing must be adequately secured.
g. Adequate provisions should be made for weekend care and vacation periods.
h. Mammals should be supplied by a recognized scientific supply company or supplier who has documentation indicating the organisms are free of diseases.
i. Wild animals of any kind should not be brought into the classroom.
j. Handle animals only when necessary - handling should be done properly, according to the particular animal and under supervision.

k. Special handling is required when the animal is pregnant, has young, is hungry, or tired.
l. Never tease an animal, e.g., sticking fingers into cage.
m. Animal scratches and bites should be washed and reported immediately. The animal should not be destroyed.
n. All wastes must be removed and disposed of in a safe and sanitary manner.
o. No one with open cut or wound should handle an animal.
p. Children allergic to animals should not be permitted to be near or touch animals.
q. Animals must be properly cared for in an emergency situation.
r. Physical separation of animals is sometimes necessary to prevent infectious diseases and to meet environmental requirements.

2. Preventing the spread of diseases

a. House animals in clean, comfortable well-ventilated, well-heated quarters.
b. Clean drinking water must be provided.
c. Painlessly destroy sick animals.
d. Remove exposed animals to clean sterile cages.
e. Contact school authorities for proper disposal of exposed bedding and food.
f. Sterlize exposed housing.
g. Consult a veterinarian.
h. Isolate new animals for at least 2 weeks.

3. Signs of danger

a. Unusual odor from cage.
b. Animal is sluggish, unresponsive.
c. Constant bickering, fighting (don't confuse with pecking order).
d. Loss of appetite.
e. Hair, eyes or skin change color.
f. Unusual discharges.
g. Dead body or remnants in cage.
h. Frequent sneezing.

4. Don't:

a. Handle nursing females.
b. "Cure" an animal brought in by students.
c. "Mend" a broken bone.
d. Dissect an animal found along the highway.
e. Pet wild lab animals.

5. Cold-blooded animals

a. Wash hands after handling snakes, turtles, fish, frogs, toads, etc. Their habitat should be disposed of carefully. Turtles should be handled only when absolutely necessary. They carry salmonella, a disease lethal to man. A thorough scrubbing is mandatory.

b. After a period of observation, the animal should be returned to its natural environment.
c. Poisonous snakes, snapping turtles, disease-carrying insects, and harmful spiders should not be kept in the classroom.
d. Handling should be supervised and executed properly. Leather gloves may be utilized.
e. Housing should be kept clean and well ventilated. Optimum conditions for each species should be observed. Cages should be constructed to prevent escape and intrusion from students, etc.
f. Proper diet and water must be available.
g. Bites should be washed and reported to the office.

References

Animal Care From Protozoa to Small Mammals, California: Addison-Wesley Publishing Company, 1977.

Basic Care of Experimental Animals, New York: Animal Welfare Institute, 1968.

Care and Use of Laboratory Animals, Washington, D.C.: U.S. Department of HEW, 1972.

III. CHEMICALS

REFERENCE PAGE FOR CHEMICALS

1. Protective clothing and glasses should be worn if there is a possibility of splashing or spillage of chemicals. For more information see Appendix D, Federal and State Laws.

2. An ABC-type extinguisher should be readily available when using flammable chemicals. See Chapter IX Open Flames.

3. Students should never carry apparatus in congested areas.

4. Students should never taste, smell, or touch an unknown chemical.

5. All chemicals should be labeled. Unmarked chemicals must be discarded. See Precautions #10 and #12, page 12 .

6. Proper disposal of chemicals is mandatory. For more information see Precautions #16, page 13.

7. Sulfuric acid vapor is toxic. For more information see Chemical Labeling #32, page 16 .

8. Do not look at magnesium ribbon if it is burning. For more information see Chemical Labeling #21, page 15 .

III. CHEMICALS

Introduction

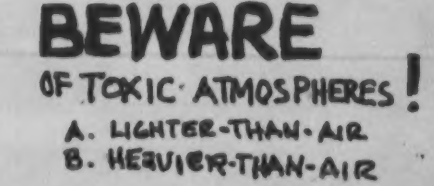
Most accidents occur because of carelessness or ignorance. It is of utmost importance that the teacher be familiar with the properties of each chemical, precautions, and emergency procedures in case of an accident. Students must be competent and supervised while handling any type of chemical. If all safety rules are observed, experiments involving the use of chemicals can be rewarding and enriching.

A. Statement of Hazards

Because most elementary teachers are not trained in chemistry, special precautions must be taken. The possibility of consumption, exposure to skin and eyes, inhalation, and mixture with incompatible substances is a threat. Control, organization and knowledge are necessary factors when dealing with chemicals in the classroom.

B. Precautions

1. Warn students of potential dangers when working with chemicals that are poisonous or require special care in handling.
2. Teach respect rather than fear.
3. Wear protective aprons and safety glasses when there is potential danger from spills or splashes of harmful chemicals.
4. An ABC extinguisher should be on hand when working with flammable chemicals.
5. Discard all broken glassware. Plastic containers should be used if applicable.
6. Teacher should conduct all experiments prior to classroom use to familiarize himself with hazards.
7. Never allow students to carry glassware in congested areas.
8. Since many chemicals are potentially poisonous, all should be stored in a locked metal cabinet.
9. Students should never taste, smell, or touch an unknown chemical.
10. All unmarked chemicals should be discarded.
11. A protective shield should be utilized during demonstrations where spattering may take place.
12. All chemical containers should be labeled as follows:
    a. Common name.
    b. Solution %.
    c. Statement of hazard and degree of hazard.
    d. Precautionary measures.
    e. Instructions in case of contact or exposure.
    f. Shelf life and date of acquisition.



13. Handle acids and bases with respect.
14. Don't allow spillage to remain on counters, floors, etc.
15. In working with gases remember that heat causes expansion-confinement of expansion causes explosion.
16. Disposal of chemicals: waste chemicals should never be placed in the classroom wastebaskets or LoDal containers (large metal refuse boxes outside schools). The possibility of injuring refuse collectors and incinerator personnel should be avoided. Contact local school district concerning proper disposal of chemicals.

C. CHEMICAL LABELING

The following chemical procedures apply to any % solutions. Those used in the elementary school are often more diluted. Precautions, however, still must be observed.

The following chemicals have been commonly used in elementary science experiments in the past. These are sample labels that might be used in identifying each.

1. Acetic Acid 28% (5 - 6 times more concentrated than vinegar)
Caution.
May cause burns.
Avoid contact with skin, eyes, and clothing.
Immediately flush with water. Get medical attention for eyes.

2. Alcohol - ISOPROPHYL
Caution.
Flammable.
Gas or vapor is an irritant and narcotic.
Handle as toxic.
Keep away from flame.
Avoid breathing.
Get medical advice if consumed.

3. Ammonia-Aqua
Warning.
Liquid causes burns. Vapor extremely irritating.
Avoid vapor. Avoid contact with skin, eyes, and clothing.
Immediately flush area with water for 15 minutes. Get medical attention for eyes.

4. Ammonium Dichromate
Warning.
Flammable, harmful dust, may cause rash or skin ulcers.
Keep away from heat, flames. Avoid contact with skin and eyes.
Immediately flush area with water for 15 minutes. For eyes, get medical attention. Wash clothing before reuse.

5. Ammonium Hydroxide
Warning.
Toxic.
Avoid contact with eyes, skin, and clothing.
Use adequate ventilation.
Flush area if exposed to skin.
If swallowed or exposed to eyes, get medical attention.

6. Baking Soda (Sodium Bicarbonate)
   No hazard.

7. Benedict's Solution
   Caution.
   Toxic.
   Avoid contact with skin and eyes.
   Handle as toxic.
   Flush area if exposed to skin.
   If exposed to eyes or swallowed, get medical attention.

8. Bleach
   Caution.
   Can be irritating to skin and eyes.
   Avoid contact with skin and eyes - wear protective clothing.
   Flush area.

9. Boric Acid
   No harmful effects.

Poisoned? Act immediately

10. Calcium Hydroxide (Garden Lime)
    No harmful toxic effects.
    Hands should be washed thoroughly after contact.
    If eyes are exposed or chemicals swallowed, get medical help.

11. Carbon Dioxide - Solid (Dry Ice)
    Warning.
    Extremely cold (-109 F). Causes severe burns. Liberates heavy gas which may cause suffocation.
    Do not get on skin or hands.
    Do not put in closed container.
    Do not enter areas where stored until properly ventilated.
    Do not taste.
    Treat as a burn - get medical help, if necessary.

12. Carbon Tetrachloride
    Danger.
    Hazardous vapor or liquid.
    May be fatal if inhaled or swallowed.
    Do not breathe vapors. Use with adequate ventilation.
    Avoid prolonged contact with skin. Do not take internally.
    Flush exposed area - get medical advice.

13. Copper Sulfate
    Caution.
    Toxic.
    Avoid contact with skin, eyes and clothing.
    Handle as toxic.
    Get medical advice, flush area.

14. Epsom Salts (Magnesium Sulfate)
    No danger.

15. Ether
Danger.
Extremely flammable - highly volatile.
Keep away from heat, sparks, and flames.
Keep in closed container.
Do not allow to evaporate to near dryness. Add water or reducing agents to lessen peroxide formation.
Should be discarded after use - do not store for use next year.

16. Food Coloring
Safe.

17. Freon 11, 12
Not toxic.
Cold.
Do not expose to skin, etc.
Treat as a burn, get medical advice.
Potential environmental hazard!

18. Hydrochloric Acid (Muriatic Acid)
Warning.
Causes burns.
Avoid contact with skin and eyes.
Avoid breathing vapor.
Immediately flush for 15 minutes.
Get medical attention for eyes.

19. Hydrogen Peroxide (7.4% or 25% volume)
Caution.
Strong Oxidant.
Avoid contact with skin and eyes. Wear rubber gloves and goggles.
Avoid contamination from any source - metals, dust, etc.
Store in original closed container.
Do not add any other product to container.
When empty, rinse thoroughly with clean water.

20. Iodine
Warning.
Gas or vapor irritant.
Causes skin irritation or burn.
Avoid contact with combustible materials.
Keep away from fire.
Flush area, get medical advice.

21. Magnesium Ribbon
No hazard when by self.
Harmful radiation when burning - do not look at it.
Get medical advice if eyes are exposed.

22. Mercury
Warning.
Vapor, liquid is toxic.
Avoid breathing vapor.
Get medical attention if inhaled or swallowed.

23. Methyl Alcohol
Caution.
Flammable.

24. Methylene Blue
No hazard in weak solution.

25. Methyl Cellulose
No immediate danger unless consumed in quantity.

26. Napthlene (Moth Balls)
Caution.
Flammable.
Gas or vapor is toxic.
Keep away from sparks - open flame.
Avoid inhalation.
Get medical aid if swallowed.

27. Paint Thinner - Turpentine
Caution.
Flammable.
Toxic.
Keep away from sparks.
Flush area, if exposed to skin.
If swallowed or exposed to eyes, get medical attention.

28, Plaster of Paris (Calcium Sulfate)
No immediate danger.

29. Silica Gel (Crystal Garden Solution)
No hazard in weak solution.

30. Sodium Hydroxide (Lye)
Caution.
Causes skin irritation or burns.
Toxic.
Avoid contact with moisture, acid.
Avoid contact with skin and eyes.
Handle as toxic.
Flush area, if explosed to skin.
If swallowed or exposed to eyes, get medical advice.

31. Stains: ESY and EOSIN
No hazard in dilute solution.

32. Sulfuric Acid (Battery Acid)
Warning.
Oxidizing material.
Gas or vapor is toxic.
Causes skin irritation or burn.
Avoid contact with combustible materials.
Avoid contact with skin, eyes and clothing.
Flush area if exposed to skin.
If swallowed or exposed to eyes, get medical attention.

33. Zinc
Avoid swallowing.

28

D. INCOMPATIBLE CHEMICALS

Many substances which are not harmful themselves can become dangerous, toxic, explosive or flammable when exposed to other materials. Care should be exercised in disposing of chemicals, as well as while using them, to see that hazardous combinations are not mixed.

The following combinations are among those described as incompatible in "Safety Alert", published by the Nassau County Science Supervisors Association. (Note that some chemicals not recommended for classroom use have been included so that teachers may be aware of the potential hazards).

Compound	Should not come in contact with:
Acetic acid	Nitric acid, peroxides, permanganates, ethylene glycol, hydroxyl compounds
Alkali metals, e.g. sodium and potassium	Carbon tetrachloride, carbon dioxide, water
Alkali metals, e.g. powdered aluminum and magnesium	Carbon tetrachloride, other hydrocarbons, halogens, carbon dioxide
Ammonium nitrate	Acids, inflammable liquids, metal powders, sulfur, chlorates, any finely divided organic or combustible substance
Bromine, chlorine	Ammonia, petroleum gases, hydrogen, sodium, benzene, finely divided metals
Chlorates	Ammonium salts, acids, metal powders, sulfur, any finely divided organic or combustible substance
Hydrocarbons, e.g. propane, benzene, and gasoline	Fluoride, chlorine, bromine, sodium peroxide
Hydrogen peroxide	Most metals and their salts, alcohols, organic substances, any inflammable substance
Hydrogen sulfide	Oxidizing gases, fuming nitric acid
Iodine	Acetylene, ammonia, hydrogen
Mercury	Acetylene, ammonia
Nitric acid (concentrate)	Acetic acid, hydrogen sulfide, inflammable liquids and gases
Potassium chlorate	Sulfuric and other acids, any organic substance
Potassium permanganate	Sulfuric acid, glycerine, ethylene glycol

Sodium peroxide	Ethyl or methyl alcohol, glacial acetic acid, carbon disulfide, glycerine, ethylene, glycol, ethyl acetate
Sulfuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate, similar compounds of other light metals.

NOTE: There are thousands of incompatible chemicals. The above items are but a few of those most commonly found in high schools. Teachers who regularly handle less common materials should have in their possession for constant reference: MANUAL OF HAZARDOUS CHEMICAL REACTIONS (latest edition), National Fire Protection Association, 60 Batterymarch St. Boston, Ma. 02110.

References

Chemical Safety Slide Rule, National Safety Council, 425 N. Michigan Ave., Chicago, Illinois 60611.

"Dangerous Materials" (Charts), Janesville, Wi.: Science Related Materials, Inc., 1969.

Safety in the Science Laboratory, Tallahassee, Florida: State Department of Education, 1968.

"Safety Regulations for Science," Detroit Public Schools, 1968.

IV. ELECTRICITY

REFERENCE PAGE FOR ELECTRICITY

1. During experiments, students should use dry cells rather than wet cells or A/C current. For further information see Statement of Hazards, page 20 .

2. Never leave a socket open and accessible to students.

3. Appliances and cords should be checked regularly.

4. When inserting or removing an electric plug, always hold it by the plug, not the cord. For more information see Precautions, page 20 .

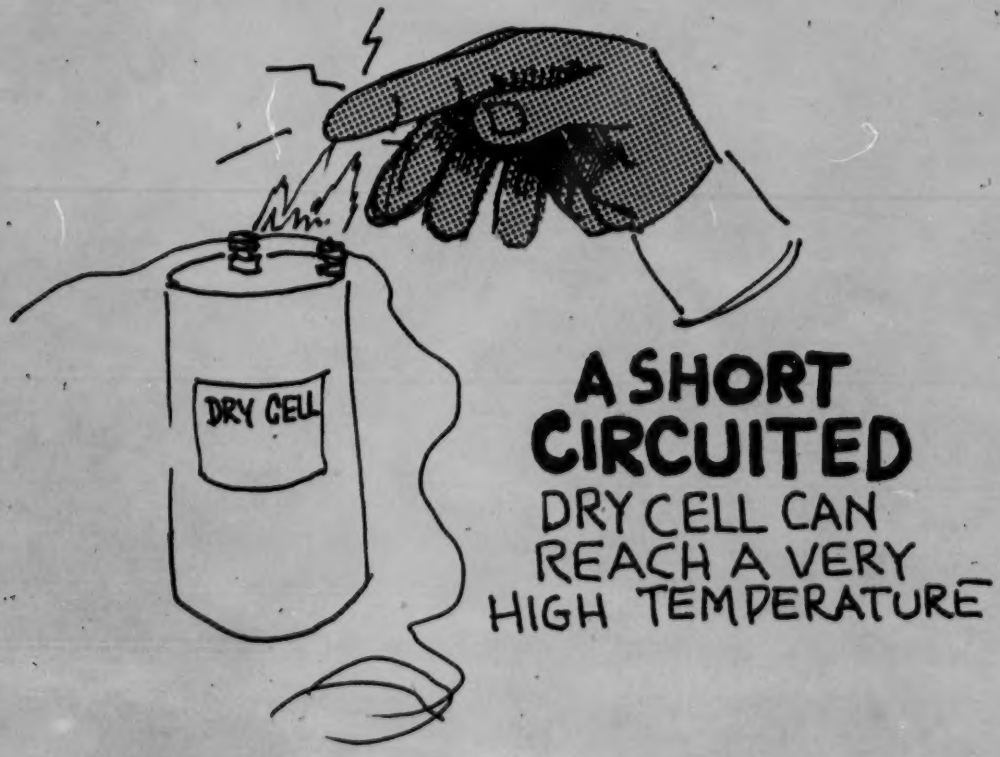
5. All electrical devices should be properly grounded. For more information see Precautions, page 20 .

6. Secure loose clothing, jewelry and hair when using machines with moving parts.

7. A short-circuited dry cell can produce a high temperature.

8. Use only carbon dioxide on electrical fires. For more information see Fire Suggestions, page 21 and Chapter IX Open Flames.

9. If skin is exposed to battery acid, thoroughly flush the area with plenty of water. For more information see Part C. First Aid, page 21 , and First Aid Chapter VI.



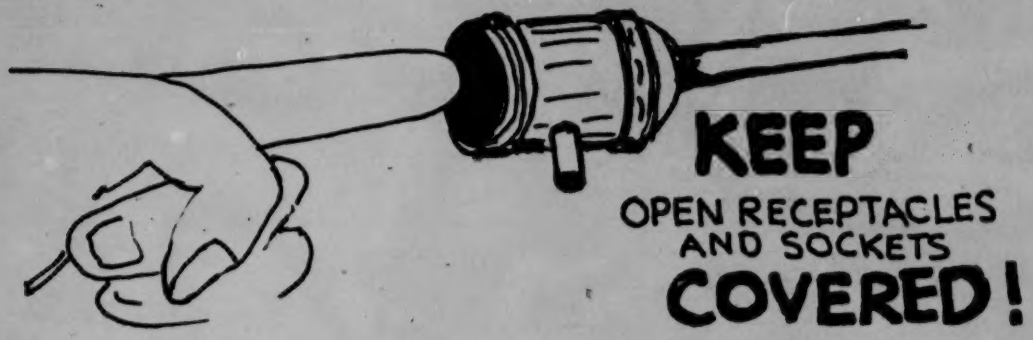
IV. ELECTRICITY

INTRODUCTION

A large number of experiments in the elementary grades deal with the principles of electricity or utilize electrical equipment such as extension cords, lights, motors, etc. It is essential that the students be aware of safety precautions and cautioned against experimenting with electric current at home or in school.

A. STATEMENT OF HAZARDS

Many electrical devices reach a very high temperature during use and can cause severe burns if handled improperly. Whenever possible, experiments dealing with the principles of electricity, should be done with the use of dry cells rather than wet cells or A/C current which could result in the child receiving a severe shock and possibly rendering him unconscious.



B. PRECAUTIONS

1. Use of electric current.
   a. Never leave an open socket in which students can put their fingers or pencils, or loose wires that are live.
   b. Electricity flows easily through some materials such as copper, aluminum and other metals.
   c. Good insulators would be rubber, porcelain, bakelite and glass.
   d. Avoid cotton covered wires.
   e. Household-type extension cords should not be used in the laboratory.
   f. Do not overload a circuit by attaching too many appliances, this can overheat the wires. Outlets along one wall are in most cases on the same circuit and may result in an overload or "blown" fuse.
   g. Inspect appliances and cords regularly. Discard cords that are badly worn or need new plugs.
   h. Use plastic insulation tape for minor breaks in the cord. Not Scotch tape or masking tape.
   i. Do not touch switches, appliances or cords with wet hands.
   j. In removing an electric plug from its socket, pull the plug, not the electric cord. The plug may separate from the cord causing a short circuit or bare wires. Result is fire or shock.
   k. When inserting an electric plug, hold plug so that flashbacks due to a possible short circuit will not burn the palm of the hand.

l. Disconnect appliances when not in use.
m. Teacher should inspect and test the appliances and experiments before using them in class.
n. Bulbs and hot plates retain their heat so handle with care.
o. All electrical devices should be properly grounded with a three pronged plug and proper receptacle or a doubly insulated machine.
p. When you overload or blow a fuse - contact the custodian.
q. When using machines with moving parts, beware of loose clothing and long hair. Any machine or appliance with belts should have a belt guard or not be used.
r. Receptacles should be grounded - accepting a three pronged plug.
s. Maintenance and repairs should be done by qualified personnel only.

2. Use of batteries
   a. Use dry cells rather than wet cells or auto batteries.
   b. Dangers of an auto battery: it gives off gas, and may spill or acid may bubble and get in the eyes of a student.
   c. Even a short circuited dry cell can produce a high temperature which can cause a serious burn.
   d. If a dry cell is cut in half, remember that the paste can cause skin and eye irritations.
3. Fire suggestions
   a. In the event of an electrical fire, attempt to disconnect the source of current.
   b. Use only CO_2 on electrical fires. Never use water, foam or soda acid.

C. FIRST AID

1. A student can be severely shocked if electricity passes through his body. He may stop breathing and artificial respiration may be necessary.
2. Burns from hot plates or hot bulbs should be covered with a sterile pad. Do not use grease or oil. Take student to the office.
3. Battery acid that splashes on a student should immediately be washed and flushed with lots of water.

References

Hone, Elizabeth, Alexander Joseph, Edward Victor, Paul Brandywein, A Sourcebook for Elementary Science, New York; Harcourt, Brace, and World, Inc. 1962.

Irving, James R. Provide for Safety in the Science Laboratory. NSTA Publication. Stock No. 471-14576. 1968.

Laboratory Safety - Published by the Department of Environmental Health and Safety. The University of Michigan Health Service. Vol. 1 No. 4.

V. FIELD TRIPS

REFERENCE PAGE FOR FIELD TRIPS

1. Even the most experienced teacher must be alert to potential dangers while on a field trip. For more information, see Statement of Hazards, page 23 .

2. Student conduct is extremely important in the out-of-doors. For more information, see Precautions #2, page 23 .

3. Proper clothing is necessary for a comfortable trip. For more information, see Precautions, page 23 .

4. Students should be able to identify poison ivy, poison oak and poison sumac before taking a field trip.

5. Glass containers should never be taken on a field trip. For more information, see Precautions, page 24 .

6. If exposed to very cold weather, never rub a numb area. It may result in tissue damage. For more information, see Wind Chill Chart, page 24 .

V. FIELD TRIPS

Introduction

In teaching elementary science today, teachers often find that the out-of-doors can provide the most appropriate learning site for their students. In order to insure that the students gain the maximum learning under the safest conditions it is necessary that the classroom teacher be well prepared for such ventures. An awareness of hazards and precautions should insure a safe and rewarding trip.

A. STATEMENT OF HAZARDS

Teachers who are relatively inexperienced in conducting field trips should be aware of potential hazards. When entering wild areas: poisonous animals, insects, reptiles and plants should be identified. Students with allergies should be closely guarded. First aid procedures may be necessary in an emergency situation. It should be emphasized that even the most experienced teacher be cautious of potentially hazardous situations.

B. PRECAUTIONS

1. Outdoor activities must be supervised and well organized. The teacher should be aware of any possible medical problems prior to the start of a field exercise-allergies, asthmatic children, etc.
2. Students should be instructed prior to field studies as to proper conduct in the out-of-doors, e.g., stay in a group, noise levels, leave nature intact, etc.
3. A practice field trip may be helpful to insure that students follow rules.
4. Proper clothing is mandatory, e.g., shoes, guard against exposure, insect bites, plant contact, hat, etc.
5. A first aid kit is advisable for trips away from the school site.
6. Students should never eat or place in their mouth any plant or plant part, or rub the sap onto the skin unless instructed and supervised by the teacher. (e.g. edible plant study).
7. Pond or stagnant water should never enter the mouth. Students with scratches or open wounds should not go near pond or stagnant water.

8. Littering should be discouraged, the teacher can do much in this area by setting the example.
9. If used, fires must be supervised at all times. A fire pit and clearance of surrounding trees, shrubs, grasses is necessary.
10. Students should be able to identify poison ivy, poison sumac, and poison oak prior to their field experience.
11. Paper, cloth, plastic bags, or plastic vials are recommended for collecting; as glass containers are easily broken.
12. The buddy system may prove helpful.
13. Repellents should be administered to guard against insect bites. However, care must be taken to insure that no student is allergic to the repellents being used.

C. WIND CHILL CHART - should be considered when taking field trips in winter:

It is of great importance that one subjected to cold be aware that the body is affected by a combination of wind and temperature. This has led to the formulation of the "Wind Chill Index". The U.S. Army Wind Chill Index shows that wind velocities do not have to be very great to cause extreme chilling. The National Safety Council states that the effects of cold can be minimized by wearing several layers of light clothing instead of one heavy layer. The trapped air acts as insulation. Also, use of clothing with venting decreases perspiration thereby preventing freezing. Clothing should be kept clean and dry.

If the exposed skin starts to tingle, the area may be rubbed; however, a numb area must not be rubbed. A numb area means that frost bite has set in and rubbing will damage the skin. Also, one should not rub the area with snow-this bruises the tissues and causes deeper freezing. In case of frost bite, the Council recommends that a physician be contacted and the victim be taken to a warm place. For frost bitten feet, carry the person--since walking on frozen feet causes greater injury. Water 110°F (42°C) to 112°F (43°C) can be applied to the frost bitten parts. While preparing the water, warm the area with a warm hand (not rubbing) or holding close to a fire. Blankets and a hot drink can be used to further warm the individual.

VI. FIRST AID

WIND CHILL CHART

Actual Thermometer Reading ^{o}C

Estimated Wind Speed KPH	10	5	-1	-7	-12	-18	-23	-29	-34	-40	-46
	Equivalent Temperature ^{o}C										
Calm	10	5	-1	-7	-12	-18	-23	-29	-34	-40	-46
8	9	3	-3	-9	-14	-20	-26	-32	-37	-43	-49
16	4	-2	-9	-16	-20	-29	-36	-43	-50	-56	-63
24	2	-6	-13	-20	-28	-37	-42	-50	-57	-64	-72
32	0	-8	-16	-23	-31	-39	-47	-54	-63	-70	-78
40	-1	-9	-18	-26	-34	-42	-50	-58	-66	-75	-83
48	-2	-11	-19	-28	-36	-44	-52	-61	-69	-78	-86
56	-3	-12	-20	-29	-37	-45	-54	-63	-72	-80	-89
64	-3	-12	-21	-29	-38	-47	-56	-64	-73	-81	-90

Wind speeds greater than 64 KPH have little additional effect.

Little Danger For Properly Clothed Person

Increasing Danger

Great Danger

Danger from Freezing of Exposed Flesh

WIND CHILL CHART

Acutal Thermometer Reading ^{o}F

Estimated Wind Speed MPH	50	40	30	20	10	0	-10	-20	-30	-40	-50
	Equivalent Temperature ^{o}F										
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57
10	40	28	16	4	-9	-21	-33	-46	-58	-70	-83
15	36	22	9	-5	-18	-36	-45	-58	-72	-85	-99
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125
35	27	11	-4	-20	-35	-49	-67	-83	-98	-113	-129
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132

Wind speeds greater than 40 MPH have little additional effect.

Little Danger for Properly Clothed Person

Increasing Danger

Great Danger

Danger From Freezing of Exposed Flesh

REFERENCE PAGE FOR FIRST AID

1. If an accident occurs, contact the principal's office and the parents or guardian immediately after checking for severe bleeding and breathing failure.

2. Wash cuts with soap and water. Do not apply an antiseptic. For more information see #1, page 28 .

3. Do not apply greases or oils to burns. For more information see #2, page 28 .

4. Do not touch an electrical shock victim while he is in contact with the current. For more information see #3, page 28 .

5. Do not give an unconscious person liquids. For more information see #7, page 29 .

6. If bitten by a warm-blooded animal, try to confine the animal for future examination. For more information see #9, page 29 .

7. If an allergic reaction occurs from an insect sting, rush victim to the hospital immediately. For more information see #10, page 30 .

8. The phone number of the Poison Control Center in Pontiac is 858-3000. For other local centers see page 30 .

VI. FIRST AID

Introduction

The purpose of first aid is to protect rather than treat. First aid is used in emergency situations where medical assistance is not readily available. The teacher, as a "first aider", must act in an objective and informed manner. While giving attention to the ill or injured victim, he must reduce anxiety and confusion in the other students. He must be calm, and give comforting support to the accident victim.

A. STATEMENT OF HAZARDS

It is important to remember that as a teacher you are not a trained nurse or doctor, but you should familiarize yourself with basic steps. In an emergency situation, first aid procedures must be strictly followed to avoid further complications. Medical help must be summoned immediately. In the schools, local regulations must be observed. The teacher must familiarize himself with his rights, liabilities and responsibilities. This is of prime importance as it can be critical to the ill or injured student.

B. PRECAUTIONS

1. Do be calm and deliberate; there are only a few "hurry up" cases.
2. Do call for help.
3. Do handle the person as little as possible.
4. Do check with the victim and witnesses concerning the accident.
5. Do make a prompt, complete, and accurate report of the accident.
6. Do be cautious rather than casual.
7. Do have an adult stay on the scene until medical assistance, parents or person designated to handle emergencies arrives.
8. Do send word to the principal's office and/or person designated to handle emergencies.
9. Do notify parents or guardian and agree on course of action to be taken.
10. Don't give liquid to an unconscious person.
11. Don't try to arouse an unconscious person.
12. Don't let the person see his own injury.
13. Don't give medication.
14. Don't incise the skin.

15. Don't diagnose.

16. Don't treat injuries that happened at home.

17. Don't reduce dislocations.

18. Don't give medical advice.

C. EMERGENCY FIRST AID PROCEDURES

1. Cuts, Punctures

Do: Immediately cleanse the wound and surrounding area with a mild soap and warm water - wiping away from the wound. Place a sterile pad over the wound until bleeding stops. Check school policy for reporting procedures.

Don't: Never put mouth over wound. Do not use fingers or soiled dressing to cleanse the wound. Do not apply an antiseptic. If the student has treated his wound improperly, take special care in following the above procedures.

2. Burns

a. Small Thermal Burns

Do: Soak a sterile gauze pad in a baking soda solution (2 T. baking soda to a quart of lukewarm water/24 to 30 grams baking soda to 1 liter water). Place pad over burn and bandage loosely. If skin is not broken place burn in clean cold water. Check school policy for procedure after caring for immediate need.

b. Chemical Burns

Normally caused by acids and bases. The burned area should be flushed with water immediately. Check school policy for procedure after caring for immediate need.

Don't: Do not apply oils, greases, baking soda or other substances to extensive burns.

3. Electrical Shock

In most cases of electrical shock the students would be exposed to, the effect would be relatively minor with little or no injury. However, precautions should be taken in any shock situation.

Do: Turn off current or free victim from contact. Begin mouth to mouth breathing if breathing has stopped. Check with AMA First Aid Manual (1969 Revision) for procedure. Check school policy for procedure after immediate treatment.

Don't: Do not touch the individual until he is separated from the current.

4. Substances in the Mouth

In a class where there are students who habitually put things in their mouth, the teacher must take special precautions when working with potentially dangerous materials.

Do: Have the individual wash out his mouth thoroughly with water.

Identify the substance. Seek advice for further treatment (office, poison control center, etc.).

Don't: Do not discard substance. Do not induce vomiting until advice has been obtained.

5. Allergies

There are a wide variety of substances which can cause an allergic reaction. A good precaution is to become aware of students with known allergies.

Do: Question the student to find out cause and possible treatment. Check with school policy. Treat for shock if needed. Seek medical attention if needed.

Don't: Do not attempt to provide more treatment than absolutely necessary.

6. Objects in the Eye

Do: Flush eye with water. Hold lid away from eye if object is solid.

Don't: Do not rub eyes.

7. Fainting and Unconsciousness

Regardless of the cause, the emergency procedure for treating an unconscious person is the same.

Do: Keep the individual in a flat position. Loosen the clothing around the neck and waist. Keep the victim warm but not hot. Keep the head turned to the side and the mouth clear. Contact parent and principal after emergency treatment has been administered. Begin mouth to mouth breathing if breathing has stopped.

Don't: Do not give an unconscious person liquids or inhalants.

8. Allergic Dermatitis (Poison ivy, oak, and sumac)

Do: Wash afflicted area with strong soap and water.

Don't: Do not apply antiseptics or dressings.

9. Animal Bites

Do: Wash area with soap and water. Hold under running water if not bleeding profusely. Apply a sterile dressing if bleeding. Contact principal and parents. With caution, catch and confine the animal. Report to local police or health department. Follow school and health department procedures for examination of the animal. Contact animal's owner if it is a pet.

Don't: Do not kill animal unless absolutely necessary. Do not damage the head if killing is necessary. Do not apply an antiseptic to the wound.

10. Stings

Do: Remove the stinger if present. Apply cold compresses to affected area. Consult office for special procedures in case of allergies. If an allergic reaction occurs, contact parents and rush immediately to the hospital.

Don't: Do not ignore an insect sting. Observe victim closely after occurence.

D. LOCAL POISON CONTROL CENTERS

Ann Arbor 764-5102	Poison Control Center University of Michigan Medical Center 48104
Detroit 494-5711	Poison Control Center Children's Hospital 3901 Beaubien 48202
TR 2-1540	Poison Information Center City Health Department 1151 Taylor Avenue 48202
864-5400	Poison Control Center Mount Carmel Mercy Hospital 6071 West Outer Drive 48235
Flint CE 2-1161	Poison Control Center Hurley Hospital 6th Avenue and Begole 48502
Lansing 372-3610	Poison Control Center St. Lawrence Hospital 1210 West Saginaw Street 48914
Monroe CH 1-6500	Poison Control Center Memorial Hospital of Monroe 700 Stewart Road 48161
Pontiac 858-3000	Poison Control Center St. Joseph Mercy Hospital 900 Woodward Avenue 48053

References:

_____, First Aid and Emergency Procedures in Schools, Lansing, Michigan: Michigan Department of Public Health, 1966.

_____, Fisher Safety Manual, Pittsburgh, Pa.: Fisher Scientific Company, 1974.

Arnold, Peter, Check List for Emergencies, Garden City, New York: Doubleday and Company, Inc., 1974.

_____, "American Red Cross First Aid Textbook", American National Red Cross, Garden City, New York: Doubleday and Company, Inc., 1957.

VII. HIGH RISK LABS

REFERENCE PAGE FOR HIGH RISK LABS

1. Treat all bacteria as if they were pathogens (disease-producing). For more information see B, 1, page 33 .

2. Dry ice produces carbon dioxide. For more information see B, 3, page 33 .

3. Never use an incandescent light source. For more information see B, 4, page 34 .

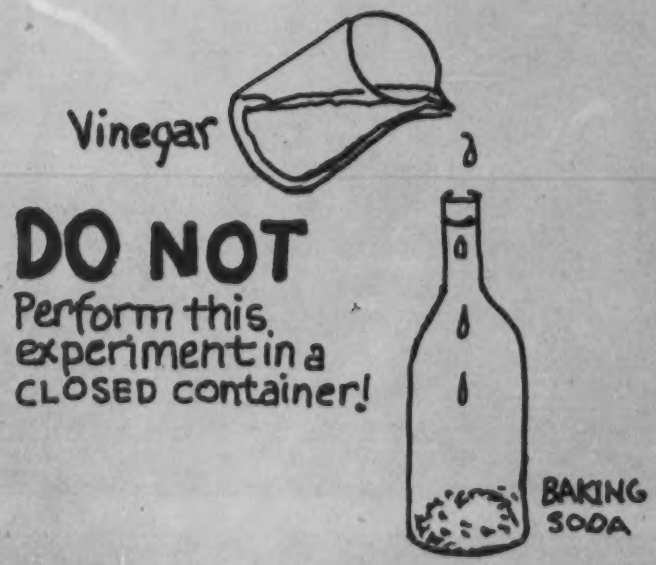
4. The dust resulting from the burning of ammonium dichromate (used in volcano demonstrations) is toxic. For more information see B, 6, page 34 .

5. Mixing baking soda and vinegar may cause an explosion. For more information see B, 7, page 34 .

6. Formaldehyde may cause an allergic reaction. For more information see B, 8, page 34 .

7. Asbestos is carcinogenic (cancer-producing). For more information see B, 9, page 34 .

8. Mercury thermometers are not recommended for use in the classroom. For more information see B, 10, page 35 .



VII. HIGH RISK LABS

Introduction

High risk experiments, although not common, are demonstrated in the elementary classroom. The teacher should have previous knowledge of each experiment and should be aware of its possible consequences. Precaution is the prime factor. Most high risk situations should be demonstrations, performed by the teacher.

A. STATEMENT OF HAZARDS

In any high risk situation there is a potential hazard. Accidents resulting from carelessness are the most common. The teacher must feel competent before performing such demonstrations. Class organization (seating and the use of plexiglass shields) and control are of utmost importance.

B. PRECAUTIONS

The following are a few of the high risk experiments which the elementary teacher should be aware of.

1. Bacteria

When experimenting with bacteria, two rules must be observed.

1. Never utilize known animal or plant pathogens.
2. Treat what you believe to be non-pathogenic organisms as if they were pathogens (disease-causing).

Precautions -

1. Plastic disposable petri dishes are advisable.
2. After exposing medium, petri dishes should be sealed and not reopened.
3. If the teacher is trained or experienced in the area of bacteriology, he should dispose of cultures, clean and sterilize all equipment after use. Otherwise, petri dishes should be discarded unopened in a place inaccessible to children. Students should never participate. Teachers should be aware of school or school district's policy on use of bacteria.
4. If a culture is accidentally dropped and broken, cover the area with a strong disinfectant and allow it to act for 10 minutes or longer.

2. Electrolysis of Water

Sodium carbonate is preferable to 5% sulfuric acid as an electrolyte.

3. Dry Ice

Do not expose to skin. Use in a well ventilated room as it produces CO_2.

4. Ultra-Violet Light

Never look directly into light source. Radiation may be hazardous to retina. Only flourescent light sources should be used: never incandescent.

5. Heat Lamp (Infrared)

Students should never touch or remain too close to bulb. A sufficient cooling time must be observed before touching bulb.

6. Ammonium Dichromate

Used in active volcano demonstrations. Caution should be taken during use. The chemical is extremely flammable and produces a great amount of heat. The dust (chromic oxide) if inhaled or swallowed could produce toxic effects.

ALTHOUGH FUN, THE VOLCANO EXPERIMENT USING AMMONIUM DICHROMATE CAN BE VERY DANGEROUS

7. Vinegar and Baking Soda

When making a carbon dioxide fire extinguisher, take precautions not to mix vinegar and baking soda in a closed container. Doing so may cause an explosion.

8. Preserved Specimens

Many lab specimens have been preserved in formaldehyde. This chemical may cause allergic or other reactions if exposed to the skin. It is recommended that all preserved specimens remain in their container during observation. If taken from the container, make certain that the specimen has been thoroughly cleansed before handling. Preserved poisonous snakes should never be taken from the container. The venom is always toxic.

9. Carcinogenic (cancer-producing) Chemicals

Hazardous - including carcinogenic - chemicals have been found on some laboratory shelves, and science supervisors and instructors are becoming increasingly aware of the potential health threat of performing certain experiments and using certain chemicals or chemical combinations.

An increasing number of diseases are found to be derived from exposure to certain chemicals and substances, exposures that began - and often ended - years and sometimes decades before the onset of symptoms. School health officials and science teachers have a responsibility to check out the new information on potential dangers

of substances used in the science classroom or laboratory.

Schools have been held liable by the courts for accidents resulting from negligence in safety procedures. If health problems are eventually traced back to classroom exposure, the schools may again be liable.

The 16 Carcinogens Regulated By OSHA

OSHA has prepared regulatory standards for the following carcinogens:

4-Nitrobiphenyl (4-NBP)
Alpha-Naphthylamine (1-NA)
4, 4'-Methylene bis (2-chloroaniline) (MOCA)
Methyl chloromethyl ether (CMME)
3, 3' Dichlorobenzidine (and its salts)
Bis chloromethvl ether (BCME)
Beta-Naphthylamine (2-NA)
Benzidine
4-Aminodiphenyl
Ethyleneimine (EL)
Beta-Propiolactone BPL)
2-Acetylaminofluorene
4-Dimethylaminoazobenzene (DAB)
N-N' trosodimethylamine (DMN)
Vinyl chloride
*Asbestos

A list of alternate names, prepared by Dr. J. B. Block, is available from your lung association.

*Asbestos is most dangerous in a powdered form - not frequently found in the elementary lab. It is recommended, however, that equipment made of asbestos (pads, blankets, etc.) be replaced by similar products made of harmless substances (i.e. ceramic, wool, aluminum).

10. Mercury

In the elementary lab, mercury is most often present in thermometers. If a mercury thermometer is broken, there is a potential hazard resulting from the inhalation of the vapors. Damage to the central nervous system is a possible danger. It is recommended that mercury thermometers be replaced by alcohol thermometers. They are less expensive and do not pose a chemical hazard. Mercury should never be used to demonstrate the physical properties of a liquid metal.

References

Safety in the Science Laboratory, State Department of Education: Tallahassee, Florida, 1968.

"Health Hazards in the Science Classroom". American Lung Association Bulletin.

VIII. LAB EQUIPMENT

REFERENCE PAGE FOR LAB EQUIPMENT

1. When using knives of any type, the student must cut away from self. For more information on knives see Precautions #1, page 37.

2. Plastic rather than glass apparatus is recommended.

3. Cracked or broken equipment should be discarded.

4. Aquariums should be emptied with a siphon. For more information see Precautions #2, page 37.

5. Use a lubricant when inserting corks or stoppers. For more information see Precaution #2, h, page 38 .

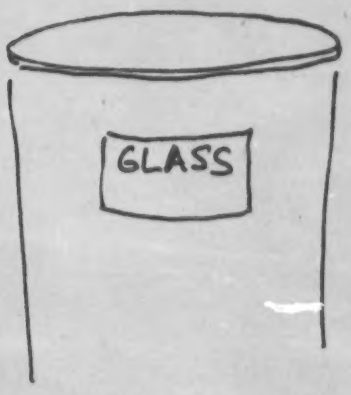
6. Flammable liquids should be properly labeled and kept in a locked cabinet. See Chapter III C, Chemical Labeling.

7. Flammable liquids should not be handled by the students. For more information on Flammable Liquids see Precautions #3, page 38 .

8. The floor should be clean and dry where machines and tools are being used. For more information see Precautions #4, page 38.

9. Pumps and belt driven machines must be fastened securely and have a belt guard.

CRACKED OR BROKEN EQUIPMENT SHOULD BE DISCARDED



VIII. LAB EQUIPMENT

INTRODUCTION

Elementary students are becoming more involved in lab experimentation. It is therefore, mandatory that they know the proper use, care, and precautions taken with the equipment they are using.

A. STATEMENT OF HAZARDS

Lab equipment must be in proper working order at all times. The teacher must check equipment before use. Cuts, abrasions, and electrical shock are all potential hazards. The maturity level of the students is directly related to the proper use of equipment. It should be left to the discretion of the teacher whether certain lab equipment be introduced into the classroom.

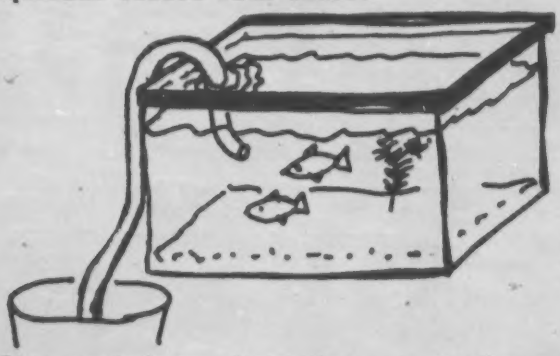
B. PRECAUTIONS

1. Knives

a. Before using any sharp instruments, the teacher must be assured that the students are competent to use such tools.
b. Students should not carry knives from experimenting stations.
c. Handling and cutting should be done away from self.
d. Knives should be stored in an area inaccessible to students.
e. Single edged blades should only be used.
f. Knives should be sharp-dull knives may cause accidental injuries.

2. Glass

a. Plastic apparatus is advisable.
b. Cracked or broken equipment should be discarded.
c. Glass apparatus should be stored safely.
d. Aquariums should be emptied with a siphon. Never move an aquarium filled with water.



e. Glass containers (aquariums, terrariums, etc.) should be placed in an area where they would not likely be bumped, jarred, etc.
f. Glassware which is to be heated should be only Pyrex or other heat treated glass.
g. All glass tubing used with rubber stoppers or corks should have beveled edges.

h. A soap solution or glycerine should be used as a lubricant when inserting corks or stoppers. The tubing should be wrapped in a cloth during insertion.
i. Corks should be removed to prevent adhering and "freezing."
j. Frozen stoppers should be removed by the teacher by splitting with a razor blade.
k. Glassware should be thoroughly cleaned after each use.
l. Broken glass should be swept up--smaller pieces can be picked up with pieces of wet cotton.
m. Heated glass gets hot. Place heated glass on an insulator of some type (i.e. ceramic plate) to prevent cracking.

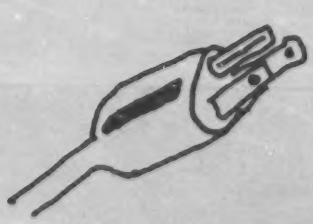
3. Flammable Liquids, etc.

a. Flammable liquids should not be handled by students.
b. They should not be used in any situation where sparks, flames, or excessive heat is present.
c. Appropriate extinguishers should be immediately available.
d. Flammable liquids should be stored in a cool, dry place (not a refrigerator.
e. Flammable materials should be kept in a locked metal cabinet.
f. They should be labeled with the following information:
    1. Common name.
    2. Solution %.
    3. Caution, warning, danger.
    4. Statement of hazards. Degree of hazard.
    5. Precautionary measures.
    6. Instructions in case of contact or exposure.
    7. Shelf life and date of acquisition.

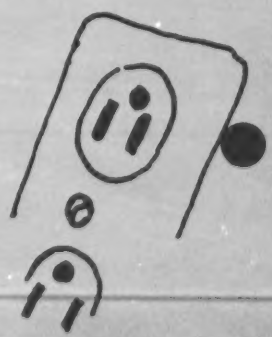
4. Tools and Machines

Some experiments require the use of machines and tools. Proper utilization will not only increase their effectiveness but efficiency and safety as well.

a. Three pronged plugs or doubly insulated equipment should be used.
b. Avoid contact with moving parts or heating elements.
c. The floor should be clean and dry where tools are being used. This will guard against shocks, slipping, and fire.
d. Use each tool only for its intended purpose.
e. Students should use power tools only after they have received proper instruction on their safe use and then only under supervision of the teacher.
f. Vacuum pumps without belt guards should not be used.
g. Pumps and belt driven machines should be fastened securely to table or bench.
h. Operator should always wear safety glasses.
i. Loose clothing, jewelry, and hair should be secured to prevent entanglement in a machine.



USE PROPERLY GROUNDED PLUGS AND RECEPTACLES



Reference

Hone, Elizabeth, Alexander Joséph, Edward Victor, PaulBrandywein. A Sourcebook for Elementary Science. New York: Harcourt, Brace, and World, Inc. 1962.

IX. OPEN FLAMES

REFERENCE PAGE FOR OPEN FLAMES

1. Candles should be placed on a ceramic or metal tray.
2. If allowed, use ethyl rather than methyl alcohol. For more information see B, 2, page 41 .
3. When using bunsen burners, never turn on the gas before lighting the match.
4. Propane or portable burners should never be used by the student. For more information see B, 4, page 41 .
5. Never place a warm or burning material in the waste basket.
6. Never reach over an open flame.
7. Know the proper procedures in case of a fire. For more information see C, 1-13, page 42 .

IX. OPEN FLAMES

Introduction

Many experiments in elementary science require the use of an open flame. It is good laboratory practice that no student experiment or teacher demonstration involving an open flame be performed without being preceded by a discussion of the correct procedures. A practice fire drill is highly recommended to insure that the students react in an orderly and rapid manner. Careful attention by the teacher to the problem and techniques of fire prevention and control may well save a student serious injury.

Before performing an experiment with open flames of any type, the teacher should become aware of school policies regarding the use of burners. Many school districts only allow candles as a source of open flames. The teacher should use discretion when handling matches. It is recommended that elementary children not be allowed to light matches at all.

A. STATEMENT OF HAZARDS

Fire is always a hazard when dealing with an open flame. Fire is usually caused by carelessness. Be certain that hair and clothing are secured, area is free from flammable materials, and the source is never transported while burning.

B. TYPES OF OPEN FLAMES

1. Candles

Always place a metal tray or asbestos pad under the candle. Watch out for the hot wax.

2. Alcohol Lamps

Place on an asbestos pad. Use Ethyl Alcohol rather than Methyl Alcohol which has a lower flashpoint. Do not permit students to carry lighted burners from the working area. Adjust wick so that the exposed part is short and trim. Always tighten the top of the lamp before igniting and replace the metal cap top when lamp is not in use.

3. Bunsen Burners

Have the lighted safety match or friction lighter ready and bring it up to the burner before the gas begins to flow. Never turn on the gas before lighting the match. Check the hose connections frequently for gas leaks. Adjust air supply until you obtain a barely visible blue flame or non-luminous flame. Do not leave burning when not in use. Do not leave unattended once lit.

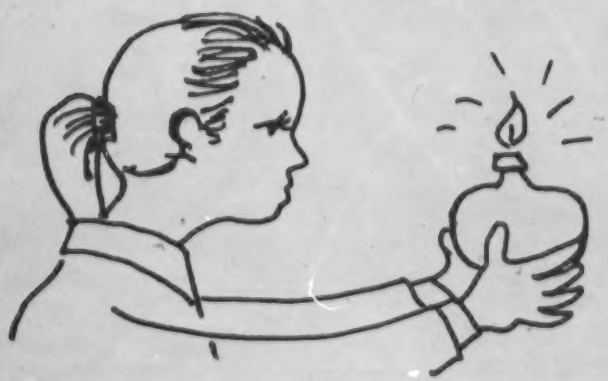
4. Portable or Propane Burners

Should be used by the teacher for demonstration and never used by the students. These propane burners contain liquified petroleum gas and

should receive special care in handling and use. The flame is much hotter than that of the regular Bunsen burner. Have the lighted match or friction lighter ready and bring it up to the portable burner before the gas begins to flow. Never turn on the gas before lighting the match. Examine the burner frequently for gas leaks. When not in use - place it under lock and key. Dispose of empty cylinders in a proper fashion. Contact school authorities for proper procedure. Do not leave burning when not in use. Do not leave unattended when lit.

C. PRECAUTIONS

1. No hanging or dangling clothing like tie, scarf, apron, sleeves, etc.
2. Long hair should be tied back in place.
3. Never light a candle or burner with a flaming piece of paper.
4. Keep flame out of draft of open window or door.
5. Keep flame away from edge of the table where it may tip and fall.
6. Keep flame away from a ledge, over hanging cabinet or shelf.
7. Always have a piece of metal or asbestos under your flame.
8. Never deposit warm or burning material in trash basket.
9. Have a sand bucket nearby for matches, burned material, etc.
10. Teacher should know the location of the gas turn off valve in the case of Bunsen burners. Test it frequently to make sure it is not frozen.
11. Most lab fires are the fault of carelessness, horseplay or an accumulation of combustible debris.
12. Intense heat may cause a student to burn his arm, clothing or hair.
13. Do not reach over an open flame.
14. Do not light one burner from another burner.
15. Check on the location of fire fighting equipment such as extinguishers, blankets, or sand. Locate fire alarm or fire exits in the event you have need of this information.



SECURE LOOSE HAIR AND CLOTHING WHEN WORKING WITH OPEN FLAMES.

D. IN CASE OF FIRE

1. Don't panic.
2. Don't allow students to run.
3. Call for help.
4. Handle injured person as little as possible.
5. Be cautious rather than casual.
6. Be calm and deliberate.
7. Hair on fire!! Smother with blanket or jacket or roll on floor. Never use CO_2.

8. Clothing on fire!! Smother with blanket or jacket or roll on floor. Never use CO_2.
9. It is recommended that a multi-purpose ABC type fire extinguisher be available for classroom use. (A - wood, paper, rubber, plastics; B - flammable liquids, gases, greases; C - electrical equipment).
10. An ABC type fire extinguisher will aggravate fires certain metals including aluminum and magnesium. In the elementary lab, this would be a rare instance. Check substances for potential hazards before using in the lab.
11. The danger in personal fires is that the affected student will seek his own aid and in a state of panic run about fanning the flames, thus magnifying the danger to himself.
12. The teacher must quickly determine the immediate and potential danger from the fire. If the fire presents a serious threat, then sound the fire alarm.
13. In the event of minor skin burns, do not apply grease or oil. Run lukewarm water over affected area for at least 15 minutes. Report to office.

References

Hane, Elizabeth, Alexander Joseph, Edward Victor, Paul Brandywein. A Sourcebook for Elementary Science, New York: Harcourt, Brace and World, Inc. 1962.

Safety in the Science Laboratory. State Department of Education, Tallahassee, Florida. Bulletin 74, 1968.

KNOW YOUR
FIRE EXTINGUISHERS

WATER TYPE

A

Ordinary Combustible Fires

DRY CHEMICAL

B

Flammable Liquid Fires
(Gas and Grease)

CO^2 TYPE
(Plastic Horn Only)

C

Electrical Equipment Fires

MULTI-PURPOSE DRY CHEMICAL TYPE

A
B C

For Ordinary Combustible Fires
Flammable Liquid Fires
Electrical Equipment Fires

DRY POWDER TYPE

D

For Combustible Metal Fires
(These Metals In Finely Divided Form Need Special Fire Attack)

USE ONLY UNDERWRITERS APPROVED EXTINGUISHERS

X. PLANTS IN THE CLASSROOM.

REFERENCE PAGE FOR PLANTS IN THE CLASSROOM

1. Don't place any plants or plant part in the mouth. For more information see Precautions, page 46 .

2. Apple seeds and mistletoe berries are toxic. For more information on toxic plants see C, page 46 , and Appendix E.

3. Seeds may be coated with toxic insecticides. For more information see D, page 47.

4. Petri dishes should be sealed and disposed of unopened. For more information see E, 1, page 47 .

5. Fungicides, pesticides, and fertilizers must be stored in a locked cabinet. For more information see E, 3, page 47 .

6. If a toxic plant or chemical is consumed, contact the poison control center immediately for advice. For more information see F, page 48 , and First Aid Chapter VI for a list of the local Poison Control Centers.

NEVER PUT A PLANT OR PLANT PART INTO THE MOUTH.

X. PLANTS IN THE CLASSROOM

Introduction

Plants are commonly found in the classroom for decorative as well as experimental purposes. Although they are seemingly harmless, the teacher should be familiar with each species. Twelve to fifteen thousand children are poisoned each year because they eat toxic plants or plant material. Precautions must be taken to prevent the occurance of such a situation. Also, some students may be allergic to certain types of plants and should not be seated near them or allowed to manipulate them.

A. STATEMENT OF HAZARDS

Because of the number of toxic plants, children must be aware of the dangers of consumption, contact with skin and allergic reactions. Pesticides, fertilizers and fungicides must also be guarded due to their potential danger.

B. PRECAUTIONS

All plants have not been thoroughly researched in terms of their toxicity. Therefore, when experimenting with or growing plants in the classroom the following "Don'ts" should be observed.

1. Don't place any plant or plant part in the mouth.
2. Don't rub the sap or fruit juice into skin or open wound.
3. Don't inhale or expose your skin or eyes to the smoke of any burning plant or plant part.
4. Don't pick any strange wild flowers or cultivated plants unknown to you.
5. Don't eat food after handling plants, without scrubbing your hands first.

C. SOME TOXIC INDOOR PLANTS

The following are only a few of the more commonly known toxic plants. With respect to the responsibility of students, the teacher may remove potentially dangerous plants from the classroom. In addition to the name of the plant the poisonous parts are indicated.

1. Dieffenbachia (dumb cane) all parts.
2. Mistletoe - berries
3. Poinsetta - leaves
4. Potato - vines and foliage
5. Tomato - vines and foliage
6. Apple - seeds
7. Aloe
8. Century plant
9. Croton
10. Elephant's Ear
11. English Ivy

12. Fishtail Palm
13. Hydrangea
14. Tobacco
15. Caladium - leaves and roots
16. Castor bean - seeds, leaves
17. Lantana - berries
18. Rhubarb - leaf stalks
19. Mushrooms - all parts
20. Daffodil - bulbs
21. Narcissus - bulbs
22. Hyacinth - bulbs
23. Oleander - leaves, branches
24. Philodendron
25. Lily of the Valley

See Appendix E for a more complete listing of toxic plants.

D. SEEDS

1. Do not put seeds in the mouth. Some species may be poisonous.
2. Seeds may be coated with hormones, fungicides and insecticides. May cause an allergic skin response, or have a toxic effect if ingested.

E. SPECIAL SITUATIONS

1. Molds and Bacteria
   a. No pathogens (a disease producing bacteria) should be introduced into the elementary classroom.
   b. When using petri dishes, they should be sealed with tape after exposure. Transferring of samples should not take place in the elementary lab. Petri dishes should be disposed unopened. Check school policies for proper disposal.
   c. When experimenting with bread and plant molds, care should be taken. Students may have allergic reactions if exposed. Also, spores may be dispersed in environment if the sample is dropped.

2. Extraction of chlorophyll
   a. Use only pyrex or hard glass test tubes.
   b. Use an emersion type electric heater or a water bath heated by a hot plate.
   c. Do not use an open flame with alcohol.
   d. If alcohol ignites, cover with glass beaker - if spilled use CO_2 or fire blanket.

3. Use of fungicides, insecticides, fertilizers.
   a. Proper labeling of all chemicals is mandatory. See Chapter III Chemicals.
   b. Teacher should supervise the use of any such chemicals.
   c. Chemicals must be stored in a locked cabinet.
   d. Chemicals should be stored in original containers.
   e. Wash hands and face after using pesticides and remove exposed clothing.

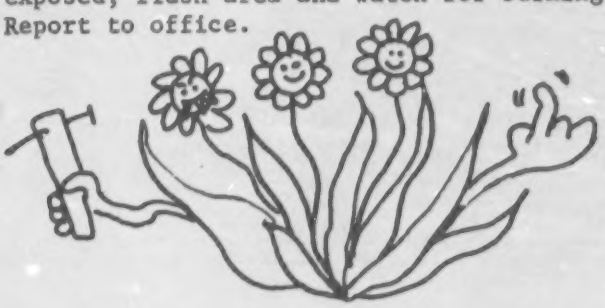
F. FIRST AID

1. Toxic plants
   a. Contact doctor or poison control center immediately.
   b. Save toxic plant for identification.
   c. Examine mouth and throat.
   d. If signs of inflammation or burning are present, do not induce vomiting. If inflammation and burning are not present, induce vomiting through one of the following methods.
      1. give 1 teaspoon syrup of ipecac (emetic made from a plant root)
      2. 2 teaspoons table salt diluted in a glass of warm water.
      3. a glass of warm soapy water.

      If victim is already vomiting, do nothing further.
   e. Keep victim's head lowered so vomitus does not enter lungs.

   See First Aid, Chapter VI, for a list of local Poison Control Centers.

2. Fungicides, pesticides, or fertilizers.
   a. If a student swallows or there is eye contact with chemical, immediate action must be taken. Contact office, and poison control center (if necessary). Flush area thoroughly with water. Do not induce vomitting until advice has been given. Save chemical consumed for reference.
   b. If skin is exposed, flush area and watch for burning or an allergic reaction. Report to office.



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Common Poisonous Plants, Children's Hospital, Poison Control Center, Detroit, Michigan. Courtesy of the Women's Auxiliary, Children's Hospital of Michigan.

Common Poisonous Plants and What You Should Know About Them, Media System, Inc., 3637 E. 7800 South, Salt Lake City, Utah 84121.

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Hardin, James W., Jay M. Arena, Human Poisonong From Nature and Cultured Plants, Second Edition, Durham, North Carolina: Duke University Press, 1974.

Hood, Mary V., Outdoor Hazards, Real and Fancied, New York: McMillan, 1955.

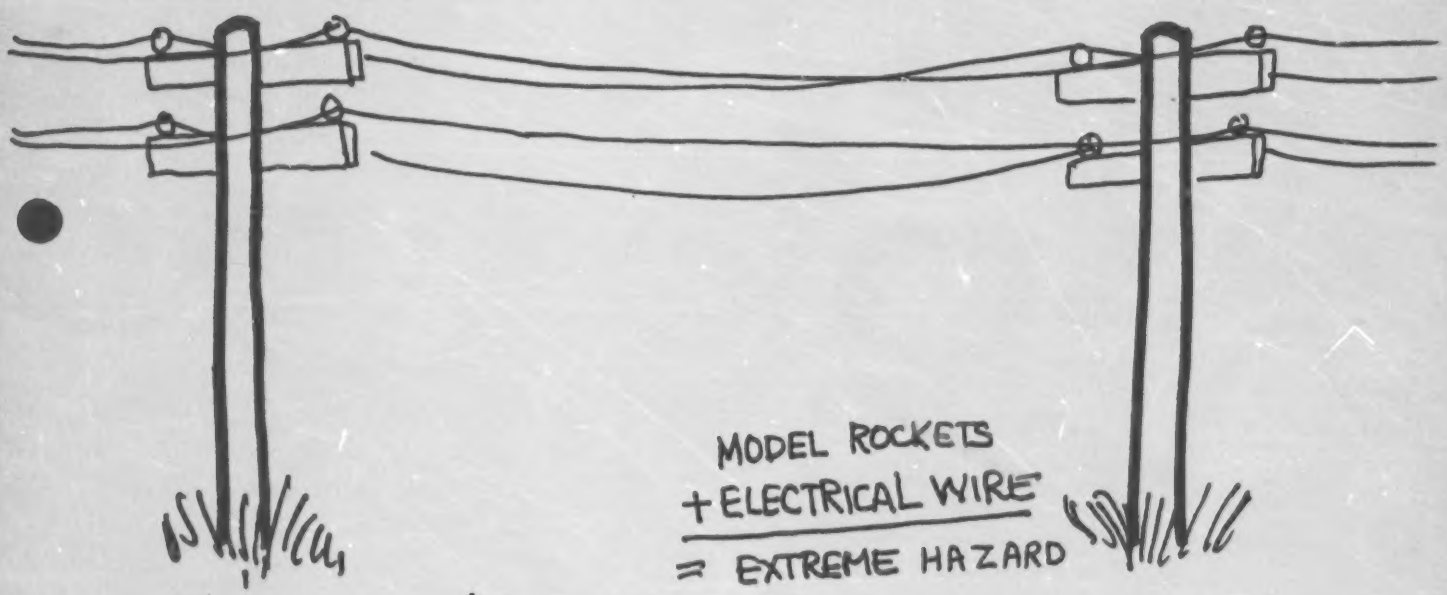
Kingsbury, John M., Deadly Harvest: A Guide To Common Poisonous Plants, New York: Holt, Rinehart and Winston, 1965.

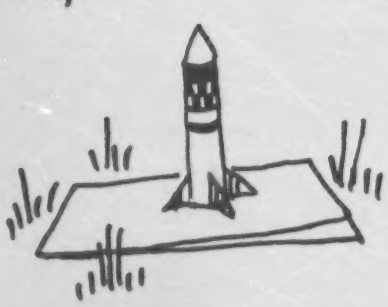
Mihalopoulos, Nicholas G., Common Poisonous Plants and What You Should Know About Them, Salt Lake City, Utah: Educational Media, Inc., 1974 Includes filmstrip and tape).

XI. MODEL ROCKETS, PLANES, MISSILES, AND PROPELLED CARS

REFERENCE PAGE FOR MODEL ROCKETS, PLANES, MISSILES, AND PROPELLED CARS

1. Propellants or fuel for model cars and planes should be stored in a cool, locked cabinet.
2. Do not launch planes near a crowded area, trees, power lines or buildings.
3. Model rockets should never be made of metal. For more information, see Precautions, page 50 .
4. The launching site should be roped off when using model rockets. For more information, see Precautions, page 50 .
5. A count down system should be used when launching model rockets.
6. Never attempt to retrieve a rocket from a power line.





XI. MODEL ROCKETS, PLANES, MISSILES, AND PROPELLED CARS

Introduction

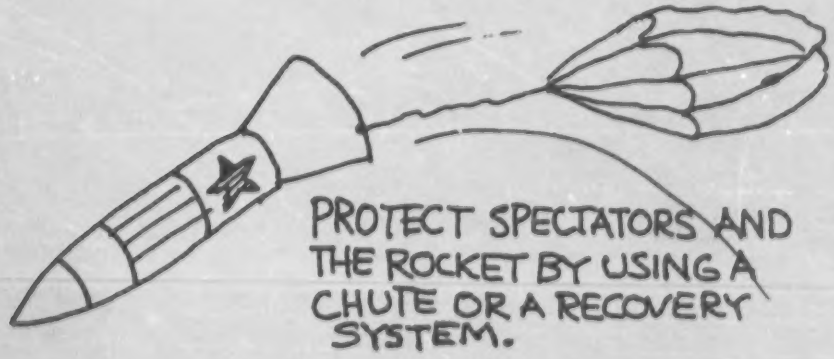
Since rockets and model planes are becoming more available to elementary students, it is imperative that they are made aware or some of the hazards and adhere to a code of safety, especially if a teacher plans to have a demonstration on the school grounds.

A. STATEMENT OF HAZARDS

Some of the hazards could lead to body burns, possible explosion or severe injuries in case of a "wild flight" into a crowded area. Any attempt on the part of the students to build "home-brewed" fuels or engines can lead to lethal bombs which may explode simply by dropping, shaking or coming into contact with static electricity.

B. PRECAUTIONS FOR ROCKETRY

1. No part of the rocket to contain metal. It should be made of paper, wood and plastic.
2. Use only factory made engines. Do not attempt to reload an engine.
3. Recovery system or use of chute will save the rocket and protect a crowd.
4. Total weight will not be over 453 grams (16 oz.) and the engine will not contain over 113 grams (4 oz.) of propellant.
5. Check stability of rocket before launching.
6. Distance from launching site should be at least 12 feet. Rope off the area.
7. Firing system should be electrically controlled with a spring switch which returns to "off" when released.
8. Do not permit anyone to approach the rocket unless the switch or battery has been disconnected.
9. Use six volt dry cells rather than an automobile battery. Use count down system.
10. Keep away from power lines, buildings, crowds, trees or low flying aircraft. Never launch in high winds. Launch area should be about the size of 2 football fields.
11. Launch pad should have a blast deflection to keep the engine blast off the ground.
12. Launch pad should be above eye level. Remove rod when pad is not in use.
13. Never attempt to recover a rocket from a power line.



14. Angle of launching should be within 30° of vertical. Never point it along the ground.
15. Store engines in a cool place under lock and key.
16. Check with principal before any launching. Supervise.
17. Building a rocket-use single edge razor blade to cut balsam wood and non-toxic glue.
18. Fire precautions should be considered such as use of water, soda acid, foam or CO_2 extinguisher to handle a burning rocket.
19. First aid precautions such as cuts and bruises from a "wild flight" or during construction of rocket.

C. Precautions for Propelled Cars and Model Planes

1. Propellant and/or fuel to be stored in cool place under lock and key.
2. Define the area of travel for the car or plane. Rope the area.
3. Model plane will make a lot of noise so obtain principal's permission and inform staff.
4. Propelled cars will need the length of a hallway or sidewalk. Advise the staff.
5. Be prepared for first aid requirements. Examples: fuel in the eye or on skin, engine burns on fingers, cold propellant burns on hands, cuts and bruises from "wild" trip.
6. Do not launch model plane or radio controlled plane in crowded area, near trees, power lines or buildings.
7. Balloons and kites may require control similar to rockets.

D. Model Rocket Safety Code

1. My model rockets will be made of only lightweight materials such as paper, wood and plastic with the exception of payloads, and engine holders made of wire-like material.
2. I will use only pre-loaded factory made model rocket engines in the manner recommended by the manufacturer. I will not change in any way nor attempt to reload these engines.
3. I will always use a recovery system in my model rockets that will return them safely to the ground so they may be flown again.
4. My model rocket will weigh no more than 453 grams (16 oz.) at liftoff, and the engines will contain no more than 113 grams (4 oz.) of propellant.
5. I will check the stability of my model rockets before their first flight except when launching models of already proven stability.
6. The system I use to launch my rockets will be electrically operated and will contain a switch that will return to "off" when released. I will remain at least 10 feet away from any rocket that is being launched.
7. I will not let anyone approach a model rocket on a launcher until I have made sure that either the safety interlock key has been removed or the battery has been disconnected from my launcher.
8. I will not launch my model rocket in high winds, near buildings, power lines, tall trees, low flying aircraft or under any conditions which might be dangerous to people or property.
9. My model rockets will always be launched from a cleared area, free of any easy to burn materials, and I will only use non-flammable recovery wadding in my rockets.

10. My launcher will have a blast deflector device to prevent the engine exhaust from hitting the ground directly.
11. To prevent accidental eye injury I will always place the launcher so the end of the rod is above eye level or cap the end of the rod with my hand when approaching it. I will never place my head or body over the launching rod. When my launcher is not in use I will always store it so that the launch rod is NOT in an upright position.
12. I will never attempt to recover my rocket from a power line or other dangerous places.
13. I will not launch rockets so their flight path will carry them against targets on the ground, and will never use an explosive warhead nor a payload that is intended to be flammable. My launching device will always be pointed within 30 degrees of vertical.
14. When conducting research activities with unproven designs or methods, I will, when possible, determine their reliability through pre-launch tests. I will conduct launchings of unproven designs in complete isolation from persons not participating in the actual launching.

Revised 11/69

The rules were taken from the National Association of Rocketry, Post Office Box 178, McLean, Virginia 22101.

References

1. Safety Manual and Building Rockets by Estes Industries, Box 227, Peurose, Colorado.

2. Michigan Law on Rocketry-Act 333, P.A. 1965-regards to size, type, construction, testing and launching. Paragraph 18.1236 Michigan Statutes Annotated, Comulative Supplement paragraph 18.1236.

3. Federal Aviation Administration Code, Volume VI-Part 101 on round balloons, kites, unmanned rocket and unmanned free balloons.

XII. SAFETY GLASSES

REFERENCE PAGE FOR SAFETY GLASSES

1. Demonstration areas should be protected by a plexiglass shield. For more information, see B, page 54 .

2. Students must wear safety glasses if there is a possibility of splashing or spattering. For more information, see B, page 54 and Appendix State and Federal Laws.

3. Eye protection devices must be sanitized after each use. For more information, see B, page 54 and Appendix Federal and State Laws.

XII. SAFETY GLASSES

Introduction

Accidents in the science laboratory have injured, damaged or caused the loss of student's vision. Extreme caution must be observed to prevent such incidents. Therefore, in 1972, Michigan's Legislators passed a law (Act No. 54 of the Public Acts of 1972. Enrolled Senate Bill No. 553) requiring the use of eye protection devices while using certain materials. The elementary school must be prepared to obey such regulations while executing potentially dangerous experiments. It is the teacher's responsibility to provide for the safety of his students. If the school is not equipped with eye protection devices, they should be available through the high school science laboratory. To insure that the school district is in compliance in regard to proper eye protection devices a letter from the company supplying such devices should be obtained indicating that they do comply.

A. STATEMENT OF HAZARDS

Although there are no real hazards when using eye protection devices, two precautions should be stressed: 1) Glasses must be sanitized after each use. 2) They must also fit the student properly. Adult glasses should not be used for young children.

B. PRECAUTIONS AND USE

1. A protective shield, (plexiglass, etc.) should be utilized during dangerous experiments.
2. Students should be seated far enough away from the demonstration area to ensure safety.
3. Students should be equipped with eye protective devices when:
   a. There is danger of spattering or splashing (chemicals, shattered rock, etc.).
   b. Caustic or acid materials are being used.
   c. Explosive materials are present.
   d. Hot liquids or solids are present.
4. Eye protective devices must be checked regularly for defects.
5. They should be cleaned (sanitized) daily or after use.
6. Warm soapy water is the best method of sanitizing glasses.
7. It is important to remember that seemingly harmless situations are potential hazards. The teacher must use forethought in planning activities to provide for the safety of the students.

Recommended Goggles:
Mine Safety Appliances Company (MSA), 400 Penn Center Boulevard, Pittsburgh, Pennsylvania 15235. Chemical Splash Goggles.

References

Department of Education - State Board of Education - Eye Protective Devices.

Selection Chart

Recommended Eye and Face Protectors for Use in Industry, Schools, and Colleges

1. GOGGLES, Flexible Fitting, Regular Ventilation
2. GOGGLES, Flexible Fitting, Hooded Ventilation
3. GOGGLES, Cushioned Fitting, Rigid Body
*4. SPECTACLES, Metal Frame, with Sideshields
*5. SPECTACLES, Plastic Frame, with Sideshields
*6. SPECTACLES, Metal-Plastic Frame, with Sideshields
** 7. WELDING GOGGLES, Eyecup Type, Tinted Lenses (Illustrated)
7A. CHIPPING GOGGLES, Eyecup Type, Clear Safety Lenses (Not Illustrated)
** 8. WELDING GOGGLES, Coverspec Type Tinted Lenses (Illustrated)
8A. CHIPPING GOGGLES, Coverspec Type, Clear Safety Lenses (Not Illustrated)
** 9. WELDING GOGGLES, Coverspec Type, Tinted Plate Lens
10. FACE SHIELD (Available with Plastic or Mesh Window)
**11. WELDING HELMETS

*Non-sideshield spectacles are available for limited hazard use requiring only frontal protection.
**See appendix chart "Selection of Shade Numbers for Welding Filters."

APPLICATIONS		
OPERATION	HAZARDS	RECOMMENDED PROTECTORS* Bold Type Numbers Signify Preferred Protection
ACETYLENE–BURNING ACETYLENE–CUTTING ACETYLENE–WELDING	SPARKS, HARMFUL RAYS, MOLTEN METAL, FLYING PARTICLES	7, 8, 9
CHEMICAL HANDLING	SPLASH, ACID BURNS, FUMES	2, 10 (For severe exposure add 10 over 2)
CHIPPING	FLYING PARTICLES	1, 3, 4, 5, 6, 7A, 8A
ELECTRIC (ARC) WELDING	SPARKS, INTENSE RAYS, MOLTEN METAL	11 (11 in combination with 4, 5, 6, in tinted lenses, advisable)
FURNACE OPERATIONS	GLARE, HEAT, MOLTEN METAL	7, 8, 9 (For severe exposure add 10)
GRINDING–LIGHT	FLYING PARTICLES	1, 2, 4, 5, 6, 10
GRINDING–HEAVY	FLYING PARTICLES	1, 3, 7A, 8A (For severe exposure add 10)
LABORATORY	CHEMICAL SPLASH, GLASS BREAKAGE	2 (10 when in combination with 4, 5, 6)
MACHINING	FLYING PARTICLES	1, 2, 4, 5, 6, 10
MOLTEN METALS	HEAT, GLARE, SPARKS, SPLASH	7, 8 (10 in combination with 4, 5, 6, in tinted lenses)
SPOT WELDING	FLYING PARTICLES, SPARKS	1, 2, 4, 5, 6, 10
Foundryman's	Dust, Flying Particles	7 & 8 except it is padded

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Chemical Splash Goggles

The MSA Chemical Splash Goggle has a soft, pliable frame and a clear polycarbonate lens with nominal thickness of .060". Seventeen large vent slots provide ventilation. It has a removable polyurethane foam filter under the rim that provides extra protection against chemical splash and driven mist and dust, yet freely admits clean air to inhibit fogging (with foam filter removed, goggle provides greater air flow than conventional perforated goggles). Rubber headband. No metal parts to corrode. Also available with Hydron-coated lens.

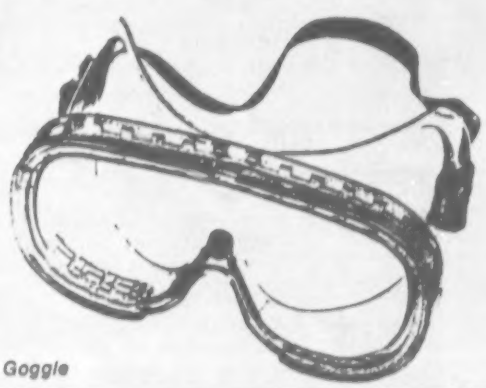
With Yellow Rim: For especially hazardous work, MSA makes a Chemical Splash Goggle with a bright yellow rim that is easy to identify and gives added warning to hazard areas. Same features as regular Splash Goggle, including positive lens retention. Available with Hydron-coated lens.

Chemical Splash Goggle

Splash Goggle with Yellow Rim

Wide Vision Goggles

The rugged MSA Wide Vision Goggle has a .060"-thick polycarbonate heavy-impact lens, positively retained, to provide heavy-impact and penetration protection. Soft vinyl body. The 17 vent slots under the rim allow more air movement across back of lens than conventional perforated-type goggles do, to inhibit fogging. Rubber headband. No metal parts. Hydron-coated lens also available.



Wide Vision Goggle

APPENDICES

Appendix A:

LIABILITY AND TEACHERS

In order for you to be aware of the legal implications that are associated with teaching you should be familiar with the following:

a. Sovereign immunity
b. Criminal negligence
c. Tort laws

In the past in many states the schools were considered to be a subordinate unit of the state government and as such were protected from suits in cases of bodily injury which resulted from the negligence of an employee under what was known as Sovereign Immunity. Simply stated it meant that you couldn't sue the King or the state. Some teachers who have heard of sovereign immunity have had the mistaken idea that they were also protected from suit, this is not the case. In fact in recent years in Michigan school boards and board members have found that the idea of sovereign immunity is no longer accepted by the courts. School boards and teacher associations now carry insurance to provide some protection for their employees.

Criminal negligence involves committing a crime against society which may involve injury or death to another individual. In a case of criminal negligence the individual is already committing a crime when the injury or death occurs which in itself would subject him to arrest, trial, and imprisonment. An example might be a teacher driving a school bus full of students on a field trip while under the influence of alcohol or drugs.

In a school accident a teacher may not be charged under criminal negligence and yet be taken to court in a tort lawsuit. Whereas in criminal negligence a crime is committed against society; in committing a tort one may break the law against an individual. A tort is defined as a civil wrong committed against another person. There are four elements which must be shown if a person is to be held liable in a tort lawsuit. They are:

1. "Duty" All people owe all other people the duty of not infringing their right to be free from physical and mental injury. As a teacher you then should know what your duty is in relation to your students.

2. "Violation or Breach of Duty" When an individual has infringed another's rights he has violated or committed a breach of duty.

3. "Cause or Proximate Cause" If a student is injured and the injury might have been prevented by you the teacher performing your job in a reasonable manner, then you could be the "proximate cause" for that injury.

4. "Injury" In the case of a student, the infringement of the individual's rights by you as the teacher results in the student being injured either physically or mentally.

One key factor in such suits is the idea of reasonableness. If the teacher acts in a manner that could be expected by any other teacher in a similar

situation then he is not guilty of a tort violation.

Gatti offers these guide rules for teachers in considering liability and teacher responsibilities under the law:

GUIDE RULE — BEING A TEACHER MAKES YOU RESPONSIBLE FOR YOUR STUDENTS' INSTRUCTION, SUPERVISION AND SAFETY. IF YOU DO NOT FULFILL THIS RESPONSIBILITY, YOU MAY BE HELD LIABLE.[1]

You can be held liable for anything that you have done which is improper or wrong. The key to your actions is "reasonableness". Gatti in describing negligence explains it in terms of reasonableness as follows:

> Negligence is: not doing something which the reasonable teacher, considering the circumstances, would ordinarily do; or doing something which the ordinary teacher of reason and prudence would not do.[2]

He further offers these rules concerning negligence and reasonableness:

GUIDE RULE — NEGLIGENCE EXISTS WHERE THE ACTIVITY OR CONDUCT ON THE PART OF THE TEACHER CREATES AN UNREASONABLE CHANCE OF DANGER. WHEN THE TEACHER IGNORES THE DANGER, OR DOES NOT SEE THE DANGER WHEN HE SHOULD, HE MAY BE HELD NEGLIGENT IF SOMEONE IS INJURED AS A RESULT.[3]

GUIDE RULE — DID THE ACT WHICH CAUSED THE INJURY EXCEED REASONABLE LIMITS, TO THE POINT WHERE THE TEACHER WAS NOT ACTING WITHIN THE RIGHTS OF HIS EMPLOYMENT? IF SO, HE IS RESPONSIBLE.[4]

Gatti also states that a teacher should not only have safety rules for the students to follow in the class but the teacher should also see that the rules are enforced.

GUIDE RULE — IF A RULE IS BROKEN, STEPS MUST BE TAKEN TO ASSURE THAT THE INFRACTION WILL NOT OCCUR A SECOND TIME. IF A TEACHER DOES NOT TAKE FURTHER STEPS, HE MIGHT BE FOUND LIABLE ON THE GROUNDS THAT THE RULE DID NOT REALLY EXIST, EXCEPT ON PAPER.[5]

Along with reasonableness the idea of forseeability is important in determining if a teacher has acted in a responsible manner. Gatti offers the following rule on forseeability:

GUIDE RULE — INJURY IS GENERALLY FORESEEABLE IN SITUATIONS (1) WHERE LARGE CROWDS OF STUDENTS ARE GATHERED WITHOUT SUPERVISION; (2) IN SPECIALIZED ACTIVITIES IN VOCATIONAL EDUCATION, PHYSICAL EDUCATION AND SCIENCE CLASSES; OR (3) IN CASES WHERE YOU ARE ABSENT FROM THE ROOM FOR AN UNREASONABLE AMOUNT OF TIME.[6]

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[1] Gatti, Daniel Jon. The Teacher and the Law. West Nyack, New York. Parker Publishing Co. Inc. 1972. Page 19.
[2] Ibid. Page 52.
[3] Ibid. Page 52.
[4] Ibid. Page 22.
[5] Ibid. Page 57.
[6] Ibid. Page 62.

Appendix B:

MICHIGAN OCCUPATIONAL SAFETY & HEALTH

Act 154 of P.A. 1974

Department's Authority

Make inspections of work places based upon employee complaints concerning alleged hazardous working conditions.

Conduct unscheduled inspections at reasonable times and in a reasonable manner of all places of employment in order to physically inspect work areas for compliance with safety standards.

Advise an employer that an imminent danger exists and issue administrative orders requiring that steps be taken which are necessary to avoid, correct, or remove the imminent danger.

Issue citations and proposed penalties to any employer for failure to comply with standards, rules, orders or provisions of this Act.

Issue cease operations orders when an employer fails to comply with a final order of the Board.

Employer's Responsibilities

Furnish and maintain a work environment which is free from recognized hazards that are causing or likely to cause death or serious physical harm.

Comply with specific Occupational Safety and Health Standards that apply to working conditions in their establishments.

Post notices and use other required or appropriate means of informing employees of their protections and obligations under the Act.

Post all citation appeal decisions in the same manner as citations so as to inform employees.

Employee's Responsibilities

Comply with all applicable Occupational Safety and Health Standards established under the Act.

Refrain from removing, displacing, damaging, destroying, or carrying off a safeguard furnished or provided for use in a place of employment or interfering in any way with the use thereof by any other person.

Employee's Rights

Entitled to work in a place of employment free from recognized hazards that are causing or are likely to cause death or serious physical harm.

May file a written request with the Department for an inspection where it is believed that a violation of a standard exists. Entitled to have identity withheld and to receive a written reply of Department findings.

May request an immediate inspection when an alleged imminent danger exists.

Authorized employee representative is entitled to accompany the Department representative during an inspection or investigation.

Authorized employee representative is entitled to a conference with the departmental representative to review findings upon completion of an inspection or investigation.

Entitled to know that a citation was issued by the Department through the posting of such citation near the place of violation.

Entitled to receive medical tests or examinations when required by a standard.

Entitled to be apprised by employer of a health hazard to which he or she is exposed when the hazard is covered by a standard.

Entitled to protection against being discharged or otherwise discriminated against for filing a complaint or instituting a proceeding under this Act.

NOTE: Where employees select a person to represent them, employee rights may be exercised by the "authorized employee representative" as provided in the Act.

For further information contact:

Michigan Department of Labor
Bureau of Safety & Regulation
7150 Harris Drive
Lansing, MI 48926
General Industry Division (517) 37-39620
Construction Safety Division (517) 37-39634
Safety Education & Training (517) 37-39160

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Appendix C:

HANDICAPPED STUDENTS

Some special precautions should be taken for the safety of handicapped students. The following are some guidelines.

1. The work area should be low enough to allow a student in a wheelchair to work safely. It should be constructed so that spills onto the student are prevented.

2. Whenever possible, ramps, as well as stairways, should be provided for students in wheelchairs.

3. Students in wheelchairs should be assigned work areas near exits and non-handicapped laboratory partners.

4. Students who have hearing or vision handicaps should be assigned responsible laboratory partners who are without handicaps.

5. Students who have unusual emotional, or behavioral problems should be identified at the start of the semester and be carefully monitored when using dangerous, or expensive equipment. They should be removed from the classroom when their behavior could cause a hazard to themselves or other students.

Appendix D:

FEDERAL AND STATE LAWS

1. Rocket and Missile Launching, Federal Aviation Regulation Part 101-Governs the size, type, construction, and launching considerations of model rockets. Minimum size rockets that would fall under control of this regulation would be illegal in Michigan, as they would exceed maximum allowable specification under Michigan's Model Rocket Law.

2. Michigan Model Rocket Law, Act. 333, P.A. 1965, Michigan Statutes Annotated of 1965 (18,1236) -
Specifies the size, type, construction, testing, and launching requirements for model rockets.

3. Registration of labs Handling Pathogenic Micro Organisms, Act. 308, P.A. 1927, Michigan Department of Public Health, 3500 N. Logan Street, Lansing, Michigan-
Requires the registration of all laboratory facilities utilizing pathogenic microorganisms.

4. Registration of Labs for the Human use of Animals, Act. 241, P.A. 1947, Michigan Department of Public Health, 3500 N. Logan Street, Lansing, Michigan-
Requires the registration of each individual laboratory facility utilizing animals for experimental purposes. -It should be noted that keeping animals for the purpose of observing their natural growth and development would not require registration.

   340.365-As part of the curriculum, every public school teacher in Michigan shall teach kindness and justice to, and humane treatment and protection of animals and birds.

5. Registration for all sources of Ionizing Radiation, Act. 88, P.A. 1943, Michigan Department of Public Health, 3500 N. Logan Street, Lansing, Michigan-
Requires the registration of all sources of ionizing radiation, regardless of level. This would include radioactive isotopes and materials, X-ray machines, and cathode ray tubes (i.e. black lights, shadow tubes, etc.) Anytime high voltages lead to high speed particles being produced, registration may be necessary.

6. School Fire Safety Regulations, Act. 207, P.A. 1941, Fire Marshal Division, Michigan State Police, 416 Frandor Avenue, Lansing, Michigan-
Governs the design, construction, and operation of school facilities with respect to fire safety. Chemical storage requirements are a part of this act.

7. Occupational Safety, Act. 282, P.A. 1967, Michigan Department of Labor, 300 E. Michigan Avenue, Lansing, Michigan-
Mandatory safety standards are promulgated under this act that affect all areas of the school facility. Standards requiring the guarding of power transmission equipment, floor and wall openings and stairways, and eye and face protection are but a few. Complete sets of current standards may be obtained from the Occupational Safety Standards Commission, Michigan Department of Labor.

8. Act No. 54 of the Public Acts of 1972 Requires students, teachers and visitors to wear industrial quality eye protective devices when exposure to danger exists. Eye protective devices must be sanitized prior to use. The law lists a wide variety of potentially dangerous situations in which glasses should be worn.

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Appendix F: PLANT AND ANIMAL DISEASES

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

Important Viral Diseases in Man and Other Animals; the Animals are Listed in Order of Susceptibility to Each Disease.

DISEASE	ANIMALS SUSCEPTIBLE	ORGANS AFFECTED	CHARACTERISTICS
Rabies	Man, dogs, lab. animals, carnivores, herbivores, bats.	Brain, spinal cord, salivary glands.	Neurotropic.
Pseudorabies	Cattle, guinea pigs, mice, man, monkeys, rabbits, pigs.	Brain, spinal cord, spinal ganglia, heart.	Neurotropic.
Variola (smallpox)	Man, monkeys, sheep, rabbits.	Skin, lungs.	Dermotropic, epitheliotropic.
Cowpox	Cattle, man, sheep, guinea pigs, rabbits.	Skin.	Dermotropic.
Sheeppox	Sheep, man, horses, goats.	Skin.	Dermotropic.
Fowlpox	Birds,, mice.	Skin, mouth, nasal sinuses, crop, esophagus.	Dermotropic, epitheliotropic.
Ectromelia (mousepox)	Mice.	Feet, mouth, tail, liver, spleen, pancreas.	Dermotropic, epitheliotropic.
Rubeola (measles)	Man, monkeys.	Skin, respiratory tract.	Dermotropic, epitheliotropic.
Varicella (chickenpox)	Man, monkeys, rabbits.	Skin, testicles, cornea.	Dermotropic, epitheliotropic.
Herpes simples	Man, monkeys, guinea pigs, rabbits, mice.	Skin, cornea, mouth, tonsils, brain.	Dermotropic, neurotropic.
Herpes zoster	Man, monkeys, rabbits.	Skin, brain, cornea, spinal ganglia.	Dermotropic, neurotropic.
Sabine B virus	Monkeys, man, rabbits, hamsters.	Brain, meninges, skin, spleen, adrenal glands, lymph nodes.	Neurotropic, epitheliotropic. dermotropic.
Giant cell pneumonia	Man, monkeys.	Lungs.	Epitheliotropic.
Yellow fever	Man, monkeys, mice, marsupials.	Kidneys, liver.	Epitheliotropic.

(over)

DISEASE	ANIMALS SUSCEPTIBLE	ORGANS AFFECTED	CHARACTERISTICS
Infectious hepatitis	Man.	Liver.	Epitheliotropic.
Rift Valley fever	Sheep, cattle, man, mice, ferrets, hamsters, rats (European, African rodents).	Liver, gallbladder, lymph nodes.	Epitheliotropic, endotheliotropic
Louping ill	Sheep, man, mice, monkeys, pigs.	Brain, spinal cord.	Neurotropic.
Bluetongue	Sheep, cattle, goats, mice.	Lips, tongue, gums, nose, muscles, coronary band.	Endotheliotropic epitheliotropic.
Distemper	Dogs, foxes, ferrets, racoons, mink, skunks.	Brain, urinary tract, gallbladder, lungs spleen, lymph nodes, stomach.	Neurotropic, epitheliotropic.
Canine hepatitis	Dogs, foxes.	Kidneys, liver, gallbladder, spleen, bone marrow, brain, testicles.	Epitheliotropic, mesotheliotropic neurotropic.
Panleukopenia	Cats, lions, tigers, racoons.	Ilium, colon, spleen, mesentery, lymph nodes, bone marrow.	Epitheliotropic, mesotheliotro
Feline pneumonitis	Cats, mice.	Nasal passages, conjunctiva, lungs.	Pneumotropic.
Infectious myxomatosis	Rabbits.	Skin, subcutaneous tissue, spleen, lymph nodes.	Epitheliotropic, mesotheliotropic
Shope fibroma	Rabbits, squirrels.	Subcutaneous tissue.	Mesotheliotropic
Virus III	Rabbits.	Testes, heart.	Endotheliotropic cardiotropic.
Equine virus abortion (rhinopneumonitis)	Horses, hamsters.	Lungs, liver, bile duct, lymph nodes.	Epitheliotropic.
Vesicular stomatitis	Horses, cattle, pigs, guinea pigs.	Tongue, lips, gums.	Epitheliotropic.

DISEASE	ANIMALS SUSCEPTIBLE	ORGANS AFFECTED	CHARACTERISTICS
Bovine malignant catarrh	Cattle, rabbits	Mouth, nose, eyes, trachea, lungs, lymph nodes, intestines, brain.	Pneumotropic, epitheliotropic, neurotropic.
Infectious bovine rhinotracheitis	Cattle.	Nasal passages, trachea, bronchi.	Pneumotropic.
Sporadic bovine encephalomyelitis	Cattle, guinea pigs.	Peritoneum, spinal cord, brain.	Mesotheliotropic, neurotropic.
Mucosal disease	Cattle.	Mouth, esophagus, gallbladder, kidneys, colon, lymph nodes.	Epitheliotropic, mesotheliotropic.
Foot-and-mouth disease	Cattle, man, sheep, guinea pigs, goats, reindeer, camels, rabbits, mice, birds, carnivore.	Skin, lips, tongue, palate, vulva, udder, teats, feet, conjunctiva, stomach.	Dermotropic, epitheliotropic, myotropic.
Rinderpest	Cattle, goats, rabbits.	Stomach, lymph nodes, mouth, esophagus, intestines, kidneys, urinary bladder.	Epitheliotropic, mesotheliotropic.
Hog cholera	Pigs.	Blood vessels, skin, colon, lymph nodes, urinary bladder, brain, meninges.	Endotheliotropic, neurotropic.
African swine fever	Pigs.	Blood vessels, skin, colon, lymph nodes, spleen, meninges, urinary bladder.	Endotheliotropic.
Teschen disease	Pigs.	Brain, spinal cord.	Neurotropic.
Vesicular exanthema	Pigs, horses.	Snout, lips, gums, tongue, feet.	Epitheliotropic.
Swine influenza	Pigs, ferrets, mice.	Trachea, lungs.	Pneumotropic.
Laryngotracheitis	Chickens, pheasants,	Larynx, trachea.	Epitheliotropic.

(over)

DISEASE	ANIMALS SUSCEPTIBLE	ORGANS AFFECTED	CHARACTERISTICS
Newcastle disease	Chickens, turkeys, man, mice, hamsters.	Mouth, lungs, intestines, spleen, brain.	Epitheliotropic, neurotropic.
Owl disease	Owls.	Liver, spleen.	Epitheliotropic.
Wild rat nephritis	Wild rats.	Kidneys.	Epitheliotropic.
Mouse myositis (Theiler's)	Mice.	Muscle.	Myotropic.
Mouse hepatoma	Mice.	Liver.	Epitheliotropic.
Salivary gland diseases	Man, chimpanzees, guinea pigs, rats, mice, dogs, hamsters.	Brain, lungs, liver, salivary glands, kidneys, adrenals, heart.	Epitheliotropic, neurotropic.
Lymphocytic chorio-meningitis	Mice, rats, man, monkeys, guinea pigs, dogs.	Meninges, brain, spinal cord.	Mesotheliotropic
Encephalo-myelitis (Theiler's disease)	Mice.	Spinal cord, spinal ganglia, medulla.	Neurotropic.
Dengue	Man, mice, monkeys.	Skin.	Dermatropic, neurotropic.
Polio-myelitis	Man, monkeys, mice, cotton rats.	Brain, spinal cord.	Neurotropic.
Western and eastern equine encephalitis	Horses, man, monkeys, guinea pigs, goats, cats, pigs, mice, hamsters, ducks, pheasants, turkeys.	Brain, spinal cord.	Neurotropic.
St. Louis encephalitis	Man, mice, monkeys.	Brain, spinal cord.	Neurotropic.
Japanese B encephalitis	Man, mice, guinea pigs.	Brain.	Neurotropic.
Venezuelan encephalitis	Horses, man, rabbits, guinea pigs, mice.	Brain, spinal cord, tongue.	Neurotropic, epitheliotropic.

Appendix G:

GUIDING PRINCIPLES FOR USE OF ANIMALS IN ELEMENTARY AND SECONDARY SCHOOLS

1. In biological procedures involving living organisms, species such as plants, bacteria, fungi, protozoa, worms, snails, or insects should be used whenever possible. Their wide variety and ready availability in large number, the simplicity of their maintenance and subsequent disposal makes them especially suitable for student work. In mammalian studies, non-hazardous human experiments are often educationally preferable to the use of species such as gerbils, guinea pigs or mice.

2. No procedure shall be performed on any warm-blooded animal that might cause it pain, suffering, or discomfort or otherwise interfere with its normal health. Warm-blooded animals include man, other mammals such as gerbils, guinea pigs, mice, rabbits, hamsters and rats. It also includes birds, such as hens, quail, and pigeons. This means that a student shall do unto other warm-blooded animals only what he can do to himself without pain or hazard to health.

3. No surgery shall be performed on any living vertebrate animal (mammal, bird, reptile or amphibian.)

4. No lesson or experiment shall be performed on a vertebrate animal that employs microorganisms which can cause disease in man or animal, ionizing radiation, cancer producing agents, chemicals at toxic levels, drugs producing pain or deformity, extremes of temperatures, electric or other shock, excessive noise, noxious fumes, exercise to exhaustion, overcrowding or other distressing stimuli.

5. Animal observations must be directly supervised by a competent science teacher who shall approve the plan before the student starts work. Students must have the necessary comprehension and qualifications for the work comtemplated. The supervisor shall oversee all experimental procedures, shall be responsible for their non-hazardous nature and shall, personally, inspect experimental animals during the course of the study, to ensure that their health and comfort is fully sustained.

6. Vertebrate studies shall be conducted only in locations where proper supervision is available: either in a school or an institution of research or higher education. No vertebrate animal studies shall be conducted at a home (other than observations of normal behavior of pet animals such as dogs or cats).

7. In vertebrate studies, palatable food shall be provided in sufficient quantity to maintain normal growth. Diets deficient in essential foods are prohibited. Food shall not be withdrawn for periods longer than 12 hours. Clean drinking water shall be available at all times (and shall not be replaced by alcohol or drugs).

8. Birds' eggs subjected to experimental manipulations shall not be allowed to hatch; such embryos shall be killed humanely no later than the nineteenth day of incubation. If normal egg embryos are to be hatched, satisfactory arrangements must be made for the humane disposal of chicks.

9. In the rare instances when killing of a vertebrate animal is deemed necessary, it shall be performed in an approved humane (rapid and painless) manner by an adult experienced in these techniques.

10. Projects involving vertebrate animals will normally be restricted to measuring and studying normal physiological functions such as normal growth, activity cycles, metabolism, blood circulation, learning processes, normal behavior, reproduction, communication or isolated organ techniques. None of these studies requires infliction of pain.

11. The comfort of the animal observed shall receive first consideration. The animal shall be housed in appropriate spacious, comfortable sanitary quarters. Adequate provision shall be made for its care at all times, including weekend and vacation periods. The animal shall be handled gently and humanely at all times.

12. Respect for life shall be accorded to all animals, creatures and organisms that are kept for educational purposes.

Approved by:

The Humane Society of the United States;
The Veterinary Advisory Committee
Robert C. Bay, D.V.M., Chairman
The Special Study Committee on the Use of Animals in Biomedical Research and Testing

Barbara Orlans, Ph.D., Coordinator

Note: Educators and students may obtain a free listing of recommended study projects and/or project books for pre-university levels by writing to one of the following sources:

The Animal Welfare Institute
Post Office Box 3650
Washington, D.C. 20007

The Humane Society of the United States
1604 K Street
Washington, D.C. 20006

Canadian Council on Animal Care
151 Slater Street
Ottawa, KIP 5H3, Ontario
Canada

The Humane Society of the United States, 1604 K Street, N.W., Washington, D.C. 20006

CERTIFICATION:

1. for approval to start and
2. to show that direct supervision has been provided throughout the course of the biological observations involving living non-human vertebrate animals.

Student's Name: _____
(First) (Middle Initial) (Last Name)

Grade: _____

School: _____

Address of School: _____

Species of Animals: _____ (Number) _____

Source of Animals: _____

Location where animals kept during study: _____

Title of Experiment: _____

Purpose of Study: _____

Describe, precisely, the experimental procedures which will involve living vertebrate animals:

1. This is to certify that the above named student has prepared his/her project which fully complies with these "GUIDING PRINCIPLES FOR USE OF ANIMALS IN ELEMENTARY AND SECONDARY SCHOOLS", (shown overleaf), and that permission to start this project was granted on:

_____ Signed: _____
date (Teacher)

Signed: _____
(Science Department Chairman)

2. This is to certify that the above named student has been directly supervised throughout the course of the now completed study and that no vertebrate animal has been subjected to surgery, pain, interference with normal health or lingering death.

_____ Signed: _____
date (Supervising Teacher)

Appendix H:

SAMPLE ACCIDENT REPORT FORMS

The following are some sample accident reports. It should be understood that most school districts have adopted emergency forms. The following reports may be useful in revising or improving those currently in use by a district. Also included is a checklist for the science lab.

Accident Report For Teacher

1. Name (Print) _____
(Last) (First)

Age _____ Sex _____ Grade _____

2. Parent/Guardian Name _____

Home Phone _____ Business Phone _____

3. Injury Date _____ Time _____

Location (Room) _____

Nature _____

4. Treatment First Aid Information (See List attached)

Sent to Office/Nurse _____

Hospital _____

Doctor _____

5. Description of Accident

Complete description _____

_____

_____

Equipment involved _____

_____

Witnesses _____

6. What steps should be taken to prevent similar accidents in the future? _____

_____

7. Teacher _____

Emergency Information Aid For Office

1. Name (Print) _____ Age _____
(Last) (First)

2. Address _____ City _____

3. Parent/Guardian Name _____ Relation _____

Home Phone _____ Business Phone _____

4. In case of an emergency: If no one can be reached at home or business, call one of the following:

Relative _____ Relation _____ Phone _____

Address _____ City _____

Neighbor _____ _____ Phone _____

Address _____ City _____

Doctor _____ Phone _____

Address _____ City _____

5. Date of last Tetanus Toxoid Booster _____

6. In case of accident or serious illness, I request the school to contact me. If the school is unable to reach me, I hereby authorize the school to secure emergency medical treatment from one of the above sources or make whatever arrangements deemed necessary.

Signature of parent or guardian _____

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Accident Report For Teachers

Age ___ Sex ____ Grade _____

Name (Print) _____
(Last) (First)

Address _____ City _____ Phone _____

Parent/Guardian _____ Business Phone _____

Teacher _____ Room _____ Class _____

Date & Time of Accident _____

Location of Accident _____

Nature of Injury _____

Treatment of Injury _____

Description of Accident: Give a complete description of what was taking place when the accident happened, location, equipment involved, witnesses, etc.

_____

_____

_____

Check Cause:

___ 1. Experimenting or working without authority.
___ 2. Making safety devices inoperative.
___ 3. Failure to use personal protective devices.
___ 4. Distraction, teasing, horse play.
___ 5. Unsafe clothing or hair.
___ 6. Hazardous arrangement or experimenting.
___ 7. Ignored instructions.

What safeguards or protective equipment were being used at time of accident?

_____

What safeguards should be used? _____

_____

What steps were taken to prevent similar injuries? _____

_____

General Comments: _____

_____

TO: The Principal or
Other Designated Person(s)

DATE _____

SCHOOL _____

Employee identification Number

FROM: Science Teacher

_____ _____

(Signature)

1. Incident Occurence:

   Date: _____ Time: _____ AM/PM

   Exact Location: _____

2. ☐ Personal Injury ☐ Property Damage

3. Description of Incident

   _____

   _____

   _____

4. Personal Injuries:

Name	Address	Age	Occupation

5. Was first aid administered? ☐ Yes ☐ No By whom? _____
6. Were Parents or Guardian notified? ☐ Yes ☐ No
7. Was injured person attended by a physician? ☐ Yes ☐ No
8. Name of attending physician _____
9. Was injured person admitted to a hospital? ☐ Yes ☐ No
10. Description of property damage:

    _____

    _____

11. Witnesses:

Name	Address	Age	Occupation

12. Safety equipment used:

    ☐ Fire Extinguisher ☐ Safety Glasses ☐ Shower ☐ Fire Blanket ☐ Other ____

Science Safety
Division of Secondary Education
Department of Education
Commonwealth of Virginia
Richmond, Virginia 23216 1976

endix I:

LABORATORY SAMPLE SAFETY CHECKLIST

SAFETY CHECKLIST
Science Teacher: _____ School: _____
Date: _____

Safety Checklist - Adapted for the Elementary School from: Science Safety, Division of Secondary Education, Department of Education, Commonwealth of Virginia, Richmond, Virginia 23216. July, 1976.

Any condition in-operative is considered unsafe. Check those items and locations not safe or in need of repair. Submit copies to the person designated by local district.

	Location: Classroom #	Storage Room #	Description of Unsafe Conditions
Classroom Facilities			
Doors			
Emergency Exits			
Windows			
Cabinets			
Locked metal cabinet			
Shelving			
Floor			
Ventilation			
Heat			
Lighting			
Water			
Drain (not for chemical wastes)			
Safety Equipment			
Fire Extinguishers (charged and appropriate to use)			
Fire Blanket			
Eye wash (5 ft. rubber tubing to attach to faucets)			
First Aid Kit (including snake bite and poison kit)			
General			
Tables			
Demonstration Desk			
Master Water Cut-off Valve			
Master Gas Cut-off Valve			
Disposition of Hazardous Materials (i.e. glass, chemicals, aerosol cans)			
Disposition of Unlabeled Materials			
Disposition of Unuseable Equipment			
Glassware			
Other			

Appendix J:

SUPPLIERS FOR SAFETY EQUIPMENT & SERVICES

Abso-Clean Chemical Company
17325 Lamont
Detroit, Michigan 48212
(Cleaning Chemicals & Equipment)

Aden Supply Company
5706 W. River Dr., N.E.
Belmont, Michigan 49306
(Safety Glasses)

Advertisers Publishing Co.
944 Wall Street, PO Box 602
Ann Arbor, Michigan 48107
(Custom imprinted safety awards)

Airkem Detroit, Inc.
404 West Eight Mile Road
Ferndale, Michigan 48220
(Odor Control)

The Ansul Company
16115 Meyers Road
Detroit, Michigan 48235
(Fire Protection Products)

Argus Supply Company
5940 Casmere
Detroit, Michigan 48212
(Ind. Safety & Fire Equipment)

A.J. Baxter & Company
10171 W. Jefferson
River Rouge, Michigan
(Industrial Safety Products)

Averill Equipment Company
19225 Conant Avenue
Detroit, Michigan 48234
(Safety Distributor)

Bemis & Son, Inc.
P.O. Box 151
Kalamazoo, Michigan
(Traffic Control)

Boyer Campbell & Sales
19460 Charleston
Detroit, Michigan 48203
(Safety Products)

Broner Glove Company
345 E. 9 Mile Road
Ferndale, Michigan 48220
(Industrial Work Gloves)

Contractor Machinery Company
13200 North End Avenue
Detroit, Michigan
(Construction Equipment)

Dockson Corporation
3839 Wabash Avenue
Detroit, Michigan 48208
(Head & Eye Protection)

Goodall Rubber Company of Michigan
13351 Cloverdale Avenue
Oak Park, Michigan 48237
(Industrial Rubber Goods)

Hastings Fiber Glass Products
770 S. Cook Rd., Box 218
Hastings, Michigan 49058
(Hot Line Maintenance Tools)

Howe Services, Inc.
National Bank Building
Birmingham, Michigan 48011
(Message Motivation Programs)

Hy-Test Div., International Shoe Co.
32302 Craftsbury
Farmington, Michigan
(Safety Shoes)

Jackson Products
5523 E. Nine Mile Road
Warren, Michigan 48091
(Safety Equipment & Welding Acces.)

Magline, Inc.
503 S. Mercer Street
Pinconning, Michigan 48650
(Magnesium Safety Blocks for Presses)

Mine Safety Appliances Company
19725 Ralston
Detroit, Michigan
(Safety Equipment)

National Safety Products, Inc.
116 North Hamilton Street
Saginaw, Michigan 48602
(Industrial Safety Equipment)

Port Products, Inc.
325 Main Street
Munity, Michigan
(Signs and Safety Equipment)

The Protectoseal Company
Power Materials Company
633 New Center Bldg.
Detroit, Michigan 48202
(Safety Containers)

R - J Distributing Company
11566 E. Nine Mile Road
Warren, Michigan 48089
(Reynolds Televator-Power Scaffold)

Safeco, Inc.
24295 Gibson Drive
Warren, Michigan 48090
(Industrial Safety)

Safety Products & Services, Inc.
184 Avenue A
Battle Creek, Michigan 49015
(Safety Equipment Sales & Services)

Safety Services, Inc.
407 East Michigan Avenue
Kalamazoo, Michigan 49006
(Industrial Safety Equipment Supplies)

Seco Manufacturing, Inc.
4461 W. Jefferson
Detroit, Michigan
(Safety Equipment and Supplies)

Speidel Safety Service
600 W. Commerce Road
Milford, Michigan 48042
(Industrial Safety Sales)

Standard Glove Company
28252 Terrace
Livonia, Michigan 48154
(Safety Gloves)

Steward Oxygen Service
19142 James Couzens Highway
Detroit, Michigan 48235
(Oxygen Therapy Equipment)

Sugar Beet Products Company
302 Waller Street
Saginaw, Michigan 48605
(Industrial skin cleansers & medical skin cream)

Tool Sales Company
46 Victor Avenue
Highland Park, Michigan 48203
(Safety Tools)

Wallace Optical
2870 E. Grand Blvd.
Detroit, Michigan
(Safety Glasses)

Wallace Opticians
107 N. Washington Avenue
Lansing, Michigan 48933
(Presceiption Safety Glasses)

E.L. West Company
1020 E. Jolly Road
Lansing, Michigan 48910
(Construction Safety)

LeHigh Safety Shoe Company
14234 Woodmont Road
Detroit, Michigan 48227

Midwest Safety Supply
621 Liberty Street
Jackson, Michigan 49203
(Industrial Safety Equipment)

Fisher Scientific Co.
711 Forbes Ave.
Pittsburgh, Penn. 15219

Sargent Welch Scientific Co.
7300 North Linden Ave.
Skokie, Ill. 60076

Turtox/Cambosco
Macmillan Science Co., Inc.
8200 S. Hoyne Ave.
Chicago, Ill. 60620

Science Kit Inc.
777 East Park Drive
Tonawanda, New York 14150

Central Scientific Co. (CENCO)
2600 South Kostner CENCO Center
Chicago, Ill 60623

Safety Education & Training Division
Bureau of Safety & Regulation
Michigan Department of Labor